The Afghanistan Engineering Support Program assembled this deliverable. It is an approved, official USAID document. Budget information contained herein is for illustrative purposes. All policy, personal, financial, and procurement sensitive information has been removed. Additional information on the report can be obtained from Firouz Rooyani, Tetra Tech Sr. VP International Operations, (703) 387-2151.



#### United States Agency for International Development (USAID)

Contract No: USAID KSC-229

# REVISED GEOTECHNICAL REPORT FOR

Salang Tunnel Substation, Parwan Province,

Afghanistan

#### **Prepared By**



**Shawal Geotechnical Engineering/Materials Testing Laboratory** 

Submitted By TETRA TECH

Date: December 11, 2013

**Email Address:** 

**Mobile Number** 



#### Investigated By:

# Shawal Geotechnical Engineering/Materials Testing Laboratory

# GEOTECHNICAL REPORT FOR

Salang Tunnel Substation, Parwan Province,

Afghanistan

December 11, 2013

Salang Tunnel Substation, Parwan Province, Afghanistan



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#### **Appendixes**

Appendix - A) Location Map of Boreholes and Test Pits

Appendix - B) Boreholes Log

Appendix - C) Test Pits Log

Appendix - D) Field Test Result

Appendix - E) Test Pits Laboratory Soil Test Result

Appendix - F) Borehole Laboratory Soil Test Result

Appendix - G) Field working and Laboratory analysis Photos

Appendix - H) Laboratory Certificate by (USACE-AED)

#### Salang Tunnel Substation, Parwan Province, Afghanistan



#### 1- Description about this project

#### United States Agency for International Development (USAID) is Client.

<u>TETRA TECH</u> is Contractor and also has undertaken a project that consists of design and construction of Salang Tunnel Substation, Parwan Province, Afghanistan.

M/s Shawal Geotechnical Engineering/Materials Testing Laboratory (GEMTL) received authorization from TETRA TECH to carry out subsoil investigations at the proposed site for the design of foundations and other geotechnical aspects of the proposed construction and also the Shawal (GEMTL) has function of Geotechnical Investigation and providing comprehensive Geotechnical Report of this Project.

This report presents the results of Geotechnical Site Assessment prepared by Shawal GEMTL for the proposed construction of Salang Tunnel Substation, Parwan Province, Afghanistan.

Disturbed and Undisturbed Soil samples from each Test Pits and Boreholes have taken from different depths in changing materials and transported to Shawal GEMTL Material testing Laboratory for desired lab tests.

This Geotechnical Report consist of complete field investigations, subsurface soil description of project area, In-situ test results, Lab test results, engineering evaluation and geotechnical recommendation for foundations, with Bearing capacity evaluation and other engineering evaluations and recommendations.

#### 2- Purpose of Geotechnical Investigation in this Project

For Design and construction of the foundations the Site specific geotechnical information has been necessary to other geotechnical related items contained and determine all necessary geotechnical conditions by appropriate field and laboratory investigations and also supporting the calculations in this project.

*The scope of work included the following:* 

- Review of available data pertinent to the site.
- Describing the field and laboratory phases of the investigation, together with site conditions, the foundation related subsurface conditions.
- Soil samples taken from Test Pits in polyethylene plastic wrapping to protect against moisture loss and Handling to Central Shawal GEMTL Company Material Testing Laboratory.
- Soil samples taken from Boreholes in Core Boxes and Handling to Central Shawal GEMTL Company Material Testing Laboratory.

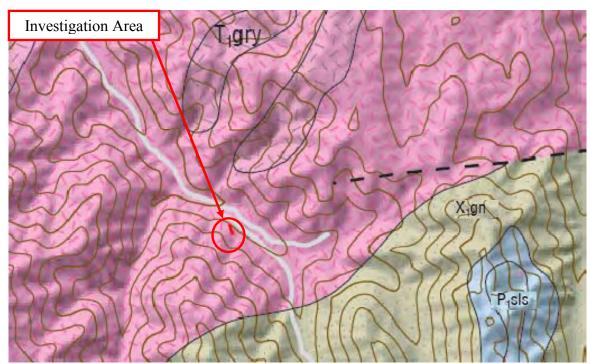
Salang Tunnel Substation, Parwan Province, Afghanistan



- Determination of the physical and mechanical properties of the soil samples representing different soil layers, as well as developing essential criteria and parameters for foundation design purposes.
- Perform required and designed Geotechnical In situ tests consist of boring of Boreholes and Excavation of Test Pit with SPT test, field density test and Percolation Test.
- Perform all required and designed Lab tests on soil samples according to ASTM standards.

#### 3- The Investigation Area General Geological Conditions

Site project Area is located on  $\underline{T_1gry}$  Granite and granosyenite (Early Triassic)—Granite, granosyenite (Phase IV).



Location of project area Construction of Salang Tunnel Substation, Parwan Province,

Afghanistan) in geological map has shown by Figure No.1.



Granite and granosyenite (Early Triassic)—Granite, granosyenite (Phase IV)



**Gneiss** (early Paleoproterozoic)—Two-mica, biotite, biotite-amphibole, garnet-biotite, garnet-sillimanite-biotite, pyroxene-amphibole, plagioclase, and cordierite gneiss; schist, migmatite, quartzite, marble, amphibolite



**Siltstone and sandstone (Early Permian)**—Siltstone and sandstone more abundant than slate, limestone, conglomerate, grit

Salang Tunnel Substation, Parwan Province, Afghanistan



#### The Investigation Area Geographical Location

The general site location is in Parwan Province, Location of project has shown by Figure No.2in Afghanistan map and Project Site area.

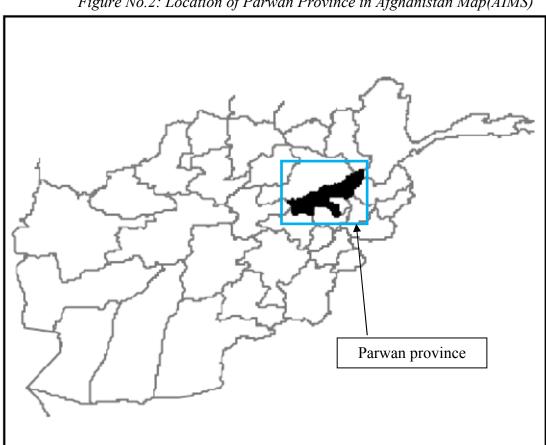


Figure No.2: Location of Parwan Province in Afghanistan Map(AIMS)

Figure 2. Location of project area in Parwan Province, Afghanistan Map (AIMS)

Salang Tunnel Substation, Parwan Province, Afghanistan



#### 4.1. Tectonic setting of investigation area

Afghanistan is located in a tectonically active region at the western extent of the Indo-Asian collision zone, where ongoing deformation has generated rugged mountainous terrain, and where large earthquakes occur frequently. These earthquakes can cause damage, not only from strong ground shaking and surface rupture, but also from liquefaction and extensive land sliding. The magnitude 6.1 earthquake of March 25, 2002 highlighted the vulnerability of Afghan communities to such hazards, and resulted in at least 1000 fatalities.

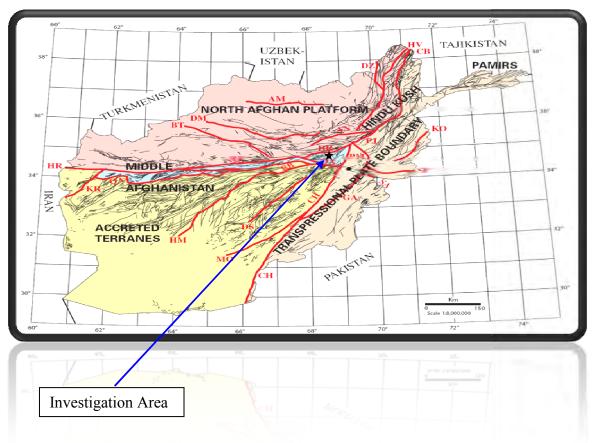


Figure No:3. Tectonic regions of Afghanistan. Pink, North Afghan platform; blue, Middle Afghanistan; yellow, terranes that were accreted to the platform (Project area).; tan, left-lateral transpressional plate boundary between the Indian and Eurasian platesBlack dot south of "PM" shows location of Kabul. Black and red fault traces from figure. Hindu Kush and Pamirs are high mountain ranges.Locations of faults that are named in the text (red). Fault traces from USGS-funded digitization of the geologic map of Shareq and Chmyriov (1977) (black). Abbreviations of fault names: AM, Alburz Marmul; AN, Andarab; BB, Bande Bayan; BT, Bande Turkestan; CH, Chaman; CB, Central Badakhsan; DZ, Darvaz; DM, Dosi Mirzavalan; GA, Gardez; HR, Hari Rod; HM, Helmand; HV, Henjvan; KR, Kaj Rod; KO, Konar; MO, Mokur; ON, Onay; PM, Paghman; PJ, Panjshir; QA, Qarghanaw; SA, Sarobi; SP, Spinghar (USGS, 2007).

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#### 4.2. Fault Characterization

Previous geological studies in Afghanistan have broadly defined the locations of major Neogene (< 25 m.y.) faults and fault zones. In this study, we more accurately locate and map individual strands of fault systems that have Quaternary move ment, and have identified previously unreported possible Qua ternary faults. Because this was done systematically through out Afghanistan, we recognized patterns of faulting that offer new insight into regional tectonics, and place limits on viable models of modern deformation. Because our interpretations of lineaments, dip-slip faults, and other features in a regional kinematic framework are strictly preliminary, the combination of our mapping and the resultant digital database provide a basic foundation and starting point for compiling geological data that can be utilized for preliminary seismic-hazard analy sis, and can be updated as new information is collected. For this map, we characterized features based on their continuity and expression in young (Quaternary) geologic deposits and on the approximate amount of vertical and(or) horizontal displacement (estimated in meters) of a specific landform. Previous mapping of the Quaternary geology of Afghanistan (Abdullah and Chmyriov, 1977; Doebrich and Wahl, 2006) provides general information about the relative ages of some deposits and landforms (fig. 4), but their absolute ages are largely unknown. In the absence of absolute age information for specific deposits, it is impossible to determine fault slip rates. However, we can broadly estimate slip rates by estimating the age of a deposit, that is, Holocene versus latest Pleistocene or late Pleistocene on the basis of its general geomorphic expression in the landscape. Even this type of generalized slip-rate estimate is a helpful indicator of the level of hazard associated with a feature. Ultimately, we need to conduct ground-based studies at selected locations to obtain critical data on the age of deposits and the amount of offset in order to determine more accurate, geologically based slip rates. Earthquakes that rupture the ground surface displace geomorphic surfaces and geologic deposits vertically, horizontally, or obliquely (a combination of vertical and horizontal offset). The Landsat imagery only gives us a vertical, two-dimensional view of the landscape, and as a result, is best suited to detect horizontally offset features, such as those along the left-lateral strike-slip Chaman fault (Figure No:4)Because of the imagery's vertical perspective, it is far more difficult to identify faults that have mainly vertical movement, and thus more difficult to measure the amount of vertical displacement. Because of the constraints imposed by the imagery's resolution and the interpretive nature of

Because of the constraints imposed by the imagery's resolution and the interpretive nature of our work, we developed a three-category scheme to qualitatively characterize the expression of

Salang Tunnel Substation, Parwan Province, Afghanistan



our mapped features in the landscape. The scheme also reflects our confidence in the role that they play in the contemporary tectonics of Afghanistan.

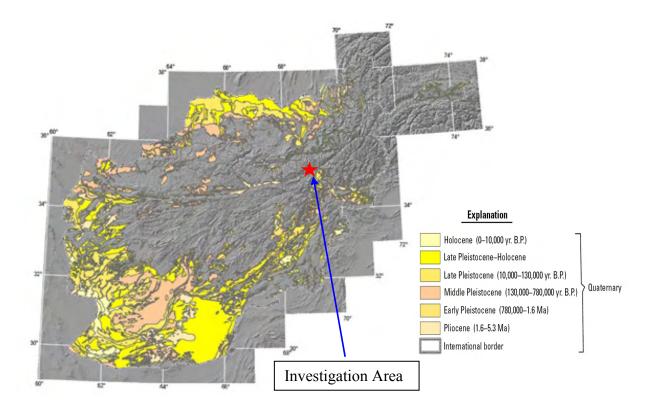


Figure No: 4. Quaternary geologic map of Afghanistan (from Doebrich and Wahl, 2006). Units are listed chronologically in the explanation. The Quaternary geology was previ-ously mapped by Abdullah and Chmyriov (1977) and is primarily confined to large basins in southwestern and north-central Afghanistan.

#### Salang Tunnel Substation, Parwan Province, Afghanistan



#### 4.3. Probable and Possible Quaternary Faults in investigation area

#### **Central Afghanistan Accreted Terranes**

Domain-7 encompasses the Helmand blocka mountainous region composed of various terranes that were accreted throughout the Mesozoic and into Cenozoic time. This region is considered to be the most structurally complex part of Afghanistan (Shareq, 1981). This rugged highland is interspersed with valleys and basins, all of which have a general northeast trend (fig. 5). Most valleys are bounded by previously mapped fault systems (Abdullah and Chmyriov, 1977; Treloar and Izatt, 1993). Treloar and Izatt (1993) described northeast-trending, Miocene-Pliocene thrust faults and folds in this domain that created an inverted basin analogous to the Katawaz basin in the Sulaiman fold and thrust belt to the southeast. However, our observations suggest that in the current tectonic regime fault motion is mainly strike-slip, possibly along preexisting thrust faults.

Tapponnier and others (1986) suggested that the Helmand block is being actively extruded to the southwest between the left-lateral Chaman and the right-lateral Hari Rud fault systems. This model is consistent with the apparent strike-slip faulting we observe in this region.

Our mapping indicates that probable Quaternary faulting is primarily concentrated on northeast-trending lineaments that coincide with the Helmand (pl. 1, no. 121) and Dorafshan fault (pl. 1, no. 120) systems, and with the Farah Rud fault (pl. 1, no. 126) to the west (fig. 5). We propose that these systems are acting as synthetic, sinistral conjugate shear systems to the major Chaman fault to the east. We mapped other widely distributed possible and probable Quaternary surficial ruptures throughout the domain; these are minor structures that could transfer slip to larger structures.

The Farah Rud fault system coincides with a well-defined strike valley, and left-laterally displaces streams that cross the fault system. Our observations of Quaternary displacement are consistent with Whitney's (1984) report of Quaternary sinistral displacement on the fault. To the southwest, evidence of Quaternary faulting dissipates in the Helmand basin, where late Pleistocene–Holocene eolian deposits (Whit-ney, 2006) may be concealing the evidence of faulting.

Along the Darafshan fault zone (pl. 1, no. 120), we mapped discontinuous, sublinear fault scarps in bedrock terrain and along range fronts. The northern limit of this fault zone is marked by a prominent north-trending rectilinear basin that is approximately 25 km wide and 45 km long (pl. 1, no. 63). We interpret this basin to be a pull-apart basin between the left-lateral Chaman and Darafshan fault systems. In the central part of Domain 7, we mapped features along a linear,

Salang Tunnel Substation, Parwan Province, Afghanistan



90-km-long, northeast-trending range front that likely corresponds to the main trace of the Helmand fault. These features generally coincide with the bedrock-colluvium contact, and locally we observed old piedmont landforms and deposits that are left-laterally displaced. To the northeast, the Helmand fault system steps to the right, is more discontinuous and fragmented, and has little or no evidence of Quaternary activity.

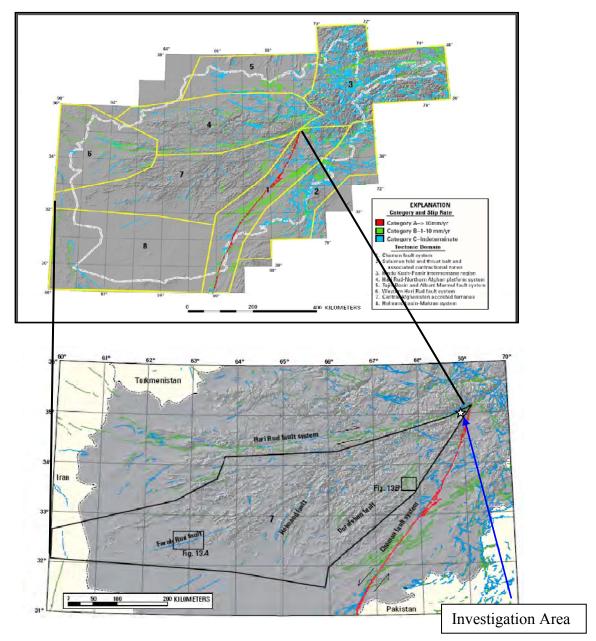


Figure 5. Tectonic domain 7—Central Afghanistan Accreted Terranes and the Helmand-Dorafshan fault system outlined in black. This structurally complex region consists of rugged northeast-trending mountains interspersed with valleys and basins. The region may be actively extruding to the southwest between the left-lateral Chaman fault system to the east and the right-lateral Hari Rud fault system to the north. Arrows indicates directions of movement on fault systems. Fault categories are category A, red; category B, green; and category C, blue.

Salang Tunnel Substation, Parwan Province, Afghanistan



#### 4.4. Seismic Hazard of investigation area

Each year Afghanistan is struck by moderate to strong earthquakes, and every few years, a powerful earthquake causes significant damage or fatalities. As Afghanistan rebuilds following decades of war and strife, new construction and development need to be designed to accommodate the hazards posed by strong earthquakes.

Earthquakes in Afghanistan are most abundant in and near the northeastern part of the country where the effects of the plate collision between India and Asia are most pronounced. In this region, tectonic forces have created the mountains of the Hindu Kush and Pamir's along with frequent moderate to large earthquakes.

Historical accounts show that the damaging earthquakes have also occurred elsewhere, even in the seismically less active parts of the country; the map of earthquakes in Afghanistan shows that the frequency and size of earthquakes varies across the country and so does the hazard.

*Table No:1. Probabilistic ground motions for selected cities (USGS, 2007).* 

		2	2%		10	0/0		
		F	Probability of	exceedanc	e in 50 years			
City	Lat.	Long.	PGA (%g)	0.2 sec	1.0 sec	PGA	0.2 sec	1.0 sec
Kabul	34.53	69.17	48	113	53	25	57	22
Mazar-e Sharif	36.70	67.10	33	78	22	16	37	11
Herat	34.35	62.18	28	62	24	7	15	4
Kandahar	31.61	65.69	13	30	16	7	16	8

The long history of earthquakes throughout much of Afghanistan highlights the need to understand the level of hazard in various parts of the country. By combining our data on the locations, sizes, and frequencies of earthquakes with the locations and estimated activity rates of major faults, scientists can forecast the probable levels of future ground shaking. The likelihood of this shaking is represented on seismic-hazard maps; the maps show the probability of exceeding a certain strength of shaking in a 50-year time period. The hazard maps show that the likelihood of strong shaking in the next 50 years is highest in northeastern Afghanistan and along the corridor adjacent to the Chaman fault system.

Salang Tunnel Substation, Parwan Province, Afghanistan



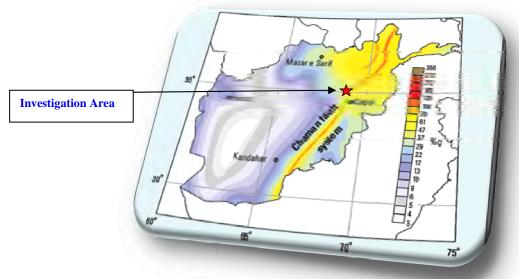


Figure No.6: Afghanistan Seismic hazard map (USGS, 2007)

Generalized seismic-hazard map of Afghanistan showing the level of shaking (peak ground acceleration measured as a percentage of the force of gravity, (g) that is likely to occur with a 2-percent probability in the next 50 years. This probability is equivalent to saying that the strength of shake at a particular site will probably be exceeded every 2,500 years. Warm colors show higher hazard, and cool colors show lower hazard. The strongest expected shaking is concentrated on major active faults in eastern and northeastern Afghanistan.

Figure No.7 Shows the Earthquake Hazard Map for Afghanistan. The star sign shows the area investigation. Peak acceleration is between 34% to 65% g and Seismic intensity and description of potential damage is VIII (Severe shaking furniture overturned and many unreinforced masonry building will Suffer moderate to Heavy Strutural damage and few will experince heavy to very heavy strutural damage).

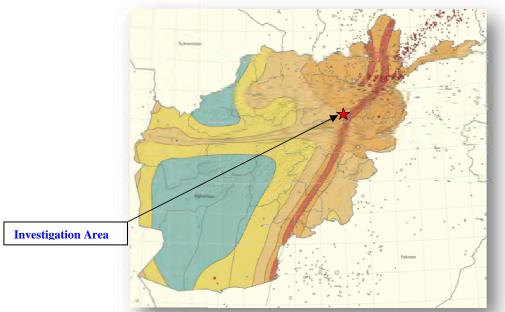


Figure No.7: Earthquake Hazard Map for Afghanistan, Peak Horizontal Acceleration with 2 Percent Probability of Exceedance in 50 years, By Oliver S. Boyd, Charles S. Mueller, and Kenneth S.Rukstales, 2007.

Salang Tunnel Substation, Parwan Province, Afghanistan



#### Seismic intensity and description of potential damage Peak acceleration (%g)< 0.17 I. Not felt, no items displaced, and no damage II. Scarcely felt, no items displaced, and no damage 0.17 - 1.4III. Weak shaking, hanging objects swing slightly, and no damage IV. Mild shaking, hanging objects swing, windows and doors rattle, and no damage 1.4 - 3.9V. Moderate shaking, hanging objects swing considerably, precarious objects may fall over, and negligible damage to unreinforced 3.9 - 9.2 masonry buildings VI. Strong shaking with few people losing their balance, furniture may be shifted, and few unreinforced masonry buildings suffer slight 9.2 - 18 structural damage VII. Very strong shaking and difficult to stand, objects fall from shelves, and many unreinforced masonry buildings will suffer slight to moderate 18 - 34 structural damage and few will experience moderate to heavy damage VIII. Severe shaking, furniture overturned, and many unreinforced masonry buildings will suffer moderate to heavy structural damage and few 34 - 65 will experience heavy to very heavy structural damage IX. Violent shaking with people forcibly thrown to the ground, monuments and columns fall, and most unreinforced masonry buildings will suffer 65 - 124 heavy to very heavy structural damage X+. Extreme shaking, and most unreinforced masonry buildings will suffer > 124 very heavy structural damage

#### Salang Tunnel Substation, Parwan Province, Afghanistan



#### 5- Geotechnical Investigation in this Project

#### 5.1. Subsurface Investigation

#### 5.1.1. Exploratory Borings, Test Pit Excavation and Sampling

For investigate of subsurface material description in proposed project area and subsurface soil conditions in proposed project area, according to Scope of Work documents of project for geotechnical study and AED design the field investigation included the following:

The borings were advanced through Core Drill Rig Machine to determine of engineering the characteristics of the subsurface materials of The field investigation included a reconnaissance of the this project site, Drilling of Boreholes with 6 meters Depth, Excavation of Test Pits with 3 meters Depth at the footing of Salang Tunnel Substation and performing standard penetration tests and obtaining disturbed split-barrel samples (per 0.75 meter) depths up to end of Test Pit and borehole.

For the purpose of subsurface soil classification, soil sampling, field density testing and laboratory soil tests, totally (3) three Boreholes drilled to a depth of 6 meters below the existing ground surface and in additional (7)Seven test pits were excavated to a depth of 3.0 meters below the existing ground surface.

*Test Pit locations depicted on the Site Plan (Appendix A)* 

Boreholes drilling, Test Pit Excavation and Soil sampling were performed under the supervisor of Shawal geotechnical engineering representative, the Shawal geotechnical engineering representative extended detailed logs of the subsurface materials and conditions encountered during the boring and excavations, and collected representative samples.

Borehole and Test Pit Log depicted on (Appendix B, C)

The Boreholes Drilling and Test Pits Excavation were carried out on November 2013using XY-2Core Drill Rig Machine and Excavator on footprint of Salang Tunnel Substation Parwan Province, Afghanistan Project.

The Soil samples were obtained & SPT Test has performed (per 0.75 meter) depths in the Boreholes and Test Pits.

#### Salang Tunnel Substation, Parwan Province, Afghanistan



#### 5.1.2. Field density test by sand cone method

for the determination of the in-place density and unit weight of undisturbed or in-situ soils in according to ASTM D-1556 used from this method. The soil or other material being tested should have sufficient cohesion or particle attraction to maintain stable sides on a small hole or excavation, and be firm enough to withstand the minor pressures exerted in digging the hole and placing the Apparatus over it, without deforming or sloughing.

Based on field density tests determined Natural Field Density varies between 1.729 gm/cc and 1.747 gm/cc.

#### 5.1.3. Standard penetration test (SPT)

Standard penetration tests were performed During the sampling procedures in the Boreholes (per 0.75 meter) depths in conjunction with the split-barrel sampling. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty inches, required to advance the split-spoon sampler One-foot into the soil (ASTM D-1586).

In this site area the SPT blow counts (N-Value) per ASTM D-1586 are in the in different strata in the range of 23 to >50blows counts.

- ➤ The SPT values from 23 to >50blow counts, Relative Soil Density was classified as "Medium to Very Dense", (Table 2).
- ➤ The SPT values from 23 to >50blow counts Relative Soil Consistency was classified as "Very Stiff to Hard", (Table 3).

Table 2. Relative Soil Density of Soils (Sand and Non Plastic Silt)

Relative Soil Density	Penetration Value (Blows/Ft)
Very Loose	0 - 4
Loose	5 - 10
Medium	11 - 30
Dense	31 - 50
Very Dense	Above 50

Salang Tunnel Substation, Parwan Province, Afghanistan



Table 3.Relative Soil Consistency (Clay and Plastic Silt)

Relative Soil Consistency	Penetration Value (Blows/Ft)
Very Soft	0 - 2
Soft	3 - 4
Medium Stiff	5 - 8
Stiff	9 - 16
Very Stiff	17 - 32
Hard	Above 32

The SPT-Resistance values (N-values), detailed description of the subsoils encountered and the depth at which samples were procured are shown on Field Test Result, (Appendix-D).

#### 5.2. Modulus of Subgrade Reaction

#### > Evaluation of Subgrade for Roads

Samples of the on-site soils were tested for Several points soaked CBR. The results of the tests are included in Summary table. The soaked CBR values against 95% maximum dry density and optimum moisture content obtained from modified ASTM compaction test vary between 12% and 26%. We recommend to use CBR of 12% for designing the road pavement.

#### ➤ Modulus of Subgrade Reaction

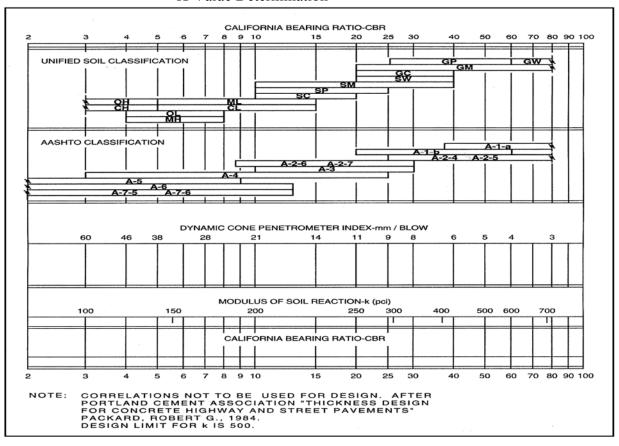
The modulus of subgrade reaction is a conceptual relationship between soil pressure and deformation that is used in the structural analysis of foundations. It is determined by performing plate load test on the on-site soil. In the absence of this test data, modulus of subgrade reaction can be estimated from ACI 360-2006 based on CBR value. The modulus of subgrade reaction for 12% CBR value is about 210pciUFC 3-260-02, approximate relationships of soil classification and soil strength Reference Table.

Salang Tunnel Substation, Parwan Province, Afghanistan



UFC 3-260-02 30 June 2001

#### K-Value Determination



following.

Summary result of all soil tests on representative soil samples in this project area has shown in

Test pits Summary test results

# Shawal GMTI

## Shawal GEMIL Shawal Geotechnical Engineering / Materials Testing Laboratory

	SUMMARY	OF	LABORATORY	TESTING
_				

PROJECT NAME: Geotechnical Explorationn for Salang Tunnel Substation, Parwan Province, Afghanistan

LOCATION Parvan Province, Salang Tunnel Substation

CLIENT USAID

CONTRACTOR TETRA TECH

ONTE	RACTO	R	TETRA	TECH															
TP No.	Sample No.	mple No.	Depth	Depth	NMC	SPT BLOWS	Particle Size Distribution (%) (ASTM D136)			Atterberg	Atterberg Limits (ASTM D4318)			Mod. Proctor (ASTM D 1557)		Direct Shea D 30		Soil Classification (ASTM D 2487)	
		(m)	%	ASTM D 1586	Gravel	Sand	Silt & Clay	LL	PL	PI	MDD (gm/cm <sup>3</sup> )	OMC (%)	%	c, kg/cm²	¢ (deg)	Symbol	Soil Description		
	1	0.75	3.6	23	0	13	87	NP	NP	NP	1.80	12	12			(ML)	Silt		
TP-2	2	1.50	4.9	32	1	15	84	NP	NP	NP				0.019	25.2	(ML)	Silt with sand		
11-2	2	2.25	6.5	35	8	11	81	NP	NP	NP						(ML)	Silt with sand		
	3	3.00	8.5	35	9	8	83	NP	NP	NP						(ML)	Silt with sand		
	1	0.75	4.5	35	15	68	17	NP	NP	NP						(SM)	Silty Sand with gravel		
то о	2	1.50	5.1	36	15	73	12	NP	NP	NP						(SM)	Silty Sand with gravel		
TP-3	2	2.25		Refusal												Boulder	Boulder		
	3	3.00		Refusal				1								Boulder	Boulder		
TP-4	1	0.75	4.2	35	35	47	18	NP	NP	NP	2.138	7.40	26	i i		(SM)	Silty Sand with gravel		
	2	1.50	4.9	38	40	47	13	NP	NP	NP						(SM)	Silty Sand with gravel		
	3	2.25	5.6	40	40	47	13	NP	NP	NP					-	(SM)	Silty Sand with gravel		
	4	3.00		Refusal												Boulder	Boulder		
	1	0.75	3.9	36	33	51	16	NP	NP	NP			İ			(SM)	Silty Sand with gravel		
	2	1.50	4.5	37	24	64	12	NP	NP	NP						(SM)	Silty Sand with gravel		
TP-5	3	2.25		Refusal												Boulder	Boulder		
	4	3.00		Refusal				A								Boulder	Boulder		
	1	0.75	3.7	26	16	71	13	NP	NP	NP			İ			(SM)	Silty Sand with gravel		
	2	1.50	4.5	33	16	71	13	NP	NP	NP						(SM)	Silty Sand with gravel		
TP-6	3	2.25	5.1	35	16	70	14	NP	NP	NP					-	(SM)	Silty Sand with gravel		
	4	3.00	5.9	38	37	49	14	NP	NP	NP						(SM)	Silty Sand with gravel		
	1	0.75	3.9	26	41	45	14	NP	NP	NP	2.183	7.80	21.8			(SM)	Silty Sand with gravel		
	2	1.50	5.1	28	43	44	13	NP	NP	NP						(SM)	Silty Sand with gravel		
TP-7	3	2.25	5.6	29	36	51	13	NP	NP	NP						(SM)	Silty Sand with gravel		
	4	3.00	6.9	38	48	31	21	NP	NP	NP						(SM)	Silty Sand with gravel		
	1	0.75	2.6	30	17	57	26	NP	NP	NP						(SM)	Silty Sand with gravel		
	2	1.50	4.3	34	39	44	17	NP	NP	NP				0.00	33.4	(SM)	Silty Sand with gravel		
TP-8	3	2.25		Refusal				1								Boulder	Boulder		
	4	3.00		Refusal				17								Boulder	Boulder		

Prepared By

Checked By Date

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# Salang Tunnel Substation, Parwan Province, Afghanistan

**Borehole Summary test results** 

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E 1	1
GM 3/	1

# Shawal GEMIL Shawal Geotechnical Engineering Materials Testing Laboratory

### SUMMARY OF LABORATORY TESTING

PROJECT NAME:	Georethnical Explorationn for Salang Tunnel Substation. Afghamistan		
LOCATION	Parvail Province, Salang Tuninal Substation		
CLIENT	USAID		

ONTRACTOR	TETRA TECH

BH NO.	Sample No.	Dopil	NMC	BLOWS	Particle 5.29	D13e)	m (h) (ASTM	Meding Limb (ASTM 54111)			DirectSimar (ASTM C 3080		Soil Committee tion (ASTM = 2487)		
	38	(cr)	8	45TM 0	Deput	Send	Sil: 6 Clay	14	BIT	PL	tyran	(deg)	Symbol .	Soil Description	
	1	0.75	4.3	27	20	45	35	NP	NP.	NE			(SM)	Sity Sand with gravel	
	2	1 50		Refusal									Boulder	Boulder	
BHS	3	2.52		Refusal									Boulder	Bouldet	
DET-	4	3.00		Refusal									Boulder	Boulaer	
	5	4.50		Refusal									Boulder	Boulder	
	6	6 ND		Refusal									Boulder	Bouldel	
	1	0.75	3.6	30	37	43	20	NP	MP	ME	12	=30	(SM)	Sity Sand with gravel	
	2	1,50		Refusal									Boulder	Boulaer	
8H3	3	2 25		Refusal									Boulder	Boulder	
an-c	4	3 00		Refusal									Boulder	Bouldet	
	5	4 50		Refusal									Boulder	Bloulaer	
	6	6 00		Refusal									Boulder	Boulaer	
	-0-	0.75	3.2	35	22	41	37	MF	NP.	NE.			(SM)	Sity Sand with gravel	
	2	1 50		Refusal									Boulder	Boulder	
ou e	3	2,25		Refusal									Boulder	Boulder	
BH-6	-4	3 00		Refusal									Boulder	Boulfaet	
	5.	4 50		Refusal									Boulder	Boultiër	
	6	5,00		Refusal									Boulder	Blodiper	

Prepared By

Checked By

Date

#### Salang Tunnel Substation, Parwan Province, Afghanistan



#### 6. Geotechnical Evaluations and Recommendations

#### 6.1. Foundation Design Requirements

Subsoil conditions disclosed by boreholes and open test pits at locations shown on the site plan indicates that the stratigraphy, in Appendix-C Test Pit Log and Appendix-B Borehole Log. And also the Basic subsoil parameters used in the engineering analyses are summarized below:

In designing foundations, the engineer must satisfy two independent foundation stability requirements, which must be met simultaneously:

- It is important to There should be an adequate safety against shear failure within the soil mass. (The working loads should not exceed the allowable bearing capacity of the soil being built upon).
- ➤ The probable maximum and differential settlements of the soil under any part of the foundations must be limited to safe and tolerable limits.

#### 6.1.1. Foundation Level

- ➤ Based on soil investigations and soil test results, <u>all footings shall be located below the</u> frost line at minimum 800mm.
- > From aspect of topsoil passing, according to site investigation results, Maximum thickness of Top soil (arable soil) is 300 mm. This Topsoil should be removed under all foundations.
- Therefore, minimum foundation level in all area should be located at minimum 800 mm in depth from NGL (Natural Ground Level).

#### 6.1.2. Selection the Type of Foundations

Selection of the particular type of foundation depends upon the character of the soil, the presence of ground water at the site, the magnitude of the imposed loads, and the project characteristics, and also to choose the type of foundation consider which is not merely safe but also economical.

There the ultimate and allowable bearing capacities are calculated, in all locations of site for this type of soils, the type of soil and relevant bearing capacities are determined in next Item, you can use the Flowing type of foundations respect to building characteristics with their allowable bearing capacities.

➤ We suggest using all type of foundation such as Single, Strip and Mat footings Suggested with combined Reinforced concrete (R.C) just with considering the calculated Bearing capacity.

#### Salang Tunnel Substation, Parwan Province, Afghanistan



#### 6.2. Recommendations about Compaction

For the placement and compaction of the embankment and sub grade fill, loose lift thickness should generally not exceed 20 cm. The moisture content of the fill material should be controlled to within  $\pm 1.5\%$  of the optimum moisture content for the field compaction effort applied. Each layer is compacted to not less than the percentage of maximum density. It is generally important to specify a high degree of compaction in fills under structures to minimize settlement and to ensure stability of a structure. The following factors should be considered in establishing specific requirements:

- (1) The sensitivity of the structure to total and differential settlement as related to structural design is particularly characteristic of structures to be founded partly on fill and partly on natural ground.
- (2) If the ability of normal compaction equipment to produce desired densities in existing or Locally available materials within a reasonable range of placement water content are considered essential, special equipment should be specified.
- (3) The compaction requirements for clean, cohesionless, granular materials will be generally higher than those for cohesive materials, because cohesionless materials readily consolidate, or liquify, when subjected to vibration.

For coarse-grained, well-graded, cohesionless soils with less than 4 percent passing the No. 200 sieve, or for poorly graded cohesionless soils with less than 10 percent, the material should be compacted at the highest practical water content, preferably saturated. Compaction by vibratory rollers generally is the most effective procedure. Experience indicates that pervious materials can be compacted to an average relative density of 85 + 5 percent with no practical difficulty. For cohesionless materials, stipulate that the fill be compacted to either a minimum density of 85 percent relative density or 95 percent of CE 55 compaction effort, whichever gives the greater density.

(4) If it is necessary to use fill material having a tendency to swell, the material should be compacted at water contents somewhat higher than optimum and to no greater density than required for stability under proposed loadings. The bearing capacity and settlement characteristics of the fill under these conditions should be checked by laboratory tests and analysis. Swelling clays can, in some instances, be permanently transformed into soils of lower plasticity and swelling potential by adding a small percentage of hydrated lime.

Salang Tunnel Substation, Parwan Province, Afghanistan



#### 6.3. Recommendations about Excavation and backfilling

#### 6.3.1. Backfill Material Specifications

#### 6.3.1.1. Satisfactory Materials

➤ Satisfactory materials comprise any materials classified by ASTM D 2487 as GW, GW-GM, GW-GC, SW, SW-SM, or SW-SC and free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, or objectionable materials.

Satisfactory materials for grading comprise stones less than 75 mm, except for fill material for pavement and building areas which comprise stones less than 75 mm in any dimension.

#### 6.3.1.2. Unsatisfactory Materials

- Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include trash; refuse; manmade fills and backfills containing debris from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.
- The materials to be used for general backfilling purposes shall be of selected fill composed of sand and or granular mixture free from organic matter or other deleterious substances, the plasticity index of the backfill material shall not exceed 5 percent. It shall be spread in lifts not exceeding 25cm in compact thickness, moisture conditioned to its optimum moisture content, and compacted to a dry density not less than 95% of the maximum dry density as obtained by Modified Proctor test (ASTM D-1557).
- ➤ All technical requirements for backfill material and limitations should be considered 6.3.2. General Backfilling Criteria
  - ➤ Above the foundation level and under the slab on grade coarse grained soil used for filling shall be clean, free from clay lumps, organic matters and any treatment of the subgrade should extend out0.50 meters from each side of building footprint.
  - > Sand and gravel shall be brought from quarries approved by the consultant.
  - ➤ At least 95% of maximum dry density in accordance with ASTM, D1556 and D1557 standard, must be achieved for the Replacement layer.

#### Salang Tunnel Substation, Parwan Province, Afghanistan



- ➤ under the foundation need compaction, compact material to average relative density of 95% with no individual test less than 95% maximum density in accordance with ASTM, D1556 and D1557standards.
- density in accordance with ASTM, D1556 and D1557standards.
- ➤ Compact the fill using suitable mechanical tamping equipment (a smooth vibrating roller would be better choice) to obtain specified density.
- ➤ Perform field density control test for every 150 m2 of fill at locations specified by consultant.
- Correct and/or re-compact materials do not meet specified compaction requirements.

  Continue corrective measures until required relative density has been achieved.
- ➤ Care shall be taken during filling, so as not to damage concrete surfaces, water proofing materials, joints or membranes that have been applied to concrete surfaces.
- ➤ The Perimeter Security Wall shall be constructed according to the Standard Design detail in the appendix.. Inside grade shall in all cases be higher than outside grade. The ground grade shall slope away from the wall for at least 5 meters and shall be kept a minimum of 3.0 meters below the top of wall for a minimum distance of 10 meters.
- ➤ The boundary of any compacted back-fill material shall extend 0.50 meters from each side of building footprint.
- ➤ Do not fill against any part of walls, or columns until each part has reached the required design strength and has been approved by the consultant.
- *Bring back-fill up uniformly around building and individual wall units.*
- ➤ Do not fill against foundations, walls, footing, and other area until concrete forms have been removed, masonry work has been pointed and protected, and concrete finishing, damp proofing, and waterproofing have been completed and approved.

#### 6.3.3. Structural fill

For structural fill the material specification shall be limited to GW or SW material with less than 12% fines (#200 sieves) and a gradation coefficient of curvature of less than 3.5. This material shall be compacted to a minimum 95% lab MDD as determined by modified proctor test. Sub grade shall be compacted to 90% lab MDD and may require compaction on the dry side using padded or sheep foot compactor which kneads the soil. Do not use vibratory rollers for this type of soil sub grade compaction.

#### Salang Tunnel Substation, Parwan Province, Afghanistan



#### 6.4. Calculations of the Bearing Capacity

Calculations of the Bearing Capacity The ultimate bearing capacity is the loading intensity that causes failure and lateral displacement of foundation materials and rapid settlement. The ultimate bearing capacity depends on the size and shape of the loaded area, the depth of the loaded area below the ground surface, groundwater conditions, the type and strength of foundation materials, and the manner in which the load is applied. The design bearing pressure equals the ultimate bearing capacity divided by a suitable factor of safety.

For evaluate the Allowable bearing capacity there are different methods as below:

1<sup>st</sup>) Allowable Bearing Capacity based on new edition Terzaghi equation (Braja, M.Das, Principle of Geotechnical Engineering, 5th edition, 2002).

#### 1<sup>st</sup>Procedure

#### Based on new edition Terzaghi equation Allowable Bearing Capacity Calculation

For calculation of the Allowable bearing capacity based on the physical and mechanical parameters of soil and foundation dimensions, has used the new Terzaghi ultimate bearing capacity equation.

Terzaghi suggest below equation for calculation of Ultimate Bearing Capacity for Shallow Foundations:

For Rigid and Square Foundation and  $d \ge B$ :

Then we will use Local Shear Failure Formula via Terzaghi new edition:

(Reference: Braja, M.Das, Principle of Geotechnical Engineering, 5th edition, 2002)

#### $Qu = 1.3cNc + qNq + 0.4\gamma BN\gamma$

#### Qu = Ultimate Bearing capacity (KN/m<sup>2</sup>)

Ground Water Level (GWL) not encountered to the water Table in dig borehole to 6 meter below the ground surface.

And:

*Nc, Nq, Ny* = Coefficients have selected from the reference table

[Reference: Braja, M.Das, 2002, chapter 15, table 15-1 page 510]

For finding the values parameters on equation:

#### According to direct shear test results minimum

 $\Phi$  = Angle of internal friction (Degrees),

 $C = Cohesion of soil (KN/m^2),$ 

C = 0 (KN/m2)  $\Phi = 33.4 ^{\circ} \sim 33^{\circ}$ 

Salang Tunnel Substation, Parwan Province, Afghanistan



#### According to field density test results:

y (minimum Natural field density) = 1.729 gm/cc Equals 16.96KN/m2

According to (Braja, M.Das, 2002) Table for  $\varphi = 33^{\circ}$ 

$$Nc = 48.09$$

$$Nq = 32.23$$

$$Ny = 31.94$$

*Wide of Foundation (B)* = 1 m for Example

Depth of Foundation (Df) = for Df=0.8 m

Safety Factor (SF) =S.F= 3

$$q = Surcharge = \gamma D_f$$

$$q = \gamma Df = 16.96 \times 0.8 = 13.56 KN/m2$$

Back to Equation:

$$Qu = 1.3cNc + qNq + 0.4 \gamma BN\gamma$$

$$Qu = (1.3 \times 0 \times 48.09) + (13.56 \times 32.23) + (0.4 \times 16.96 \times 1 \times 31.94)$$

$$Qu = 0+437.19+216.63 (KN/m2)$$

$$Qu = 653.81(KN/m2)$$

And

Qa (Allowable Bearing Capacity) = 
$$\frac{Qu}{SF}$$

$$Qa=653.81/3=217.94 \text{ KN/m}^2 \text{Equal}=2.222 \text{ kg/cm}^2 \dots \text{For } B=1 \text{ meter}$$

Note:

The Calculated soil bearing capacity is assumed for a footing wide (B) of 1 meters.

If footing designed per design documents that the footing wide (B) are Small or larger than 1 meter the allowable bearing capacity will change according to this formula:

Qa = 0+145.72+72.21B (KN/m2)

Salang Tunnel Substation, Parwan Province, Afghanistan



#### 6.5. Calculation and Estimation of the Settlement

Table No: 5. List conditions that cause settlements which occur during construction and result in only minor problems and post-construction settlements which occur after a structure is completed or after critical features are completed. Differential settlements distort a structure. A structure can generally tolerate large uniform, or nearly uniform, settlements.

Generally, essential conditions for occurrence the consolidation Settlement are:

- 1. Existence of clay soils
- 2. Shallow water table level

According to lab Test Findings of sieve analysis, Atterberg limits the below Results are achieved:

General soil type in this project area

[SM], [Silty Sand with gravel and Boulder].

Also, according to collect Field data regarding groundwater table in the project area, Ground Water Level (GWL) not encountered to the water Table in dig borehole to 6 meter below the ground surface.

Therefore, according to soil Type and groundwater table possibility of occurrence Consolidation settlement is not possible.

#### Salang Tunnel Substation, Parwan Province, Afghanistan



#### Table: No.5. Causes of Settlements [Reference: UFC 3-220-03FA, table 5.1, Page 5.2]

Cause	Comment
Compression of foundation soils under static loads.	Soft, normally consolidated clays and peaty soils are most compressible. Loose silts, sands, and gravels are also quite compressible.
Compression of soft clays due to lowering ground- water table.	Increased effective stress causes settlement with no increase in sur- face load.
Compression of cohesionless soils due to vibrations.	Loose sands and gravels are most sus- ceptible.Settlement can be caused by machine vibrations, earthquakes, and blasts.
Compression of foundation soil due to wetting.	Loose silty sands and gravels are most susceptible. Settlements can be caused by rise in groundwater table or by infiltration.
Shrinkage of cohesive soils caused by drying.	Highly plastic clays are most suscept- ible.Increase in temperature under buildings containing ovens or fur- naces may accelerate drying. Wetting of highly plastic clays can cause swelling and heave of foundations.
Loss of foundation support due to erosion.	Waterfront foundations must extend below maximum erosion depth.
Loss of foundation support due to excavation of adjacent ground.	Most pronounced in soft, saturated clays.
Loss of support due to lateral shifting of the adjacent ground	Lateral shifting may result from land- slides, slow downhill creep, or move- ment of retaining structures.
Loss of support due to formation of sinkhole.	Soils overlying cavernous limestone and broken conduits are susceptible.
Loss of support due to thaw- ing of permafrost.foundation heat.	Permafrost should be insulated from
Loss of support due to partial or complete liquefaction.	Loose, saturated sands are most susceptible.
Downdrag on piles driven through soft clay.	Loading on piles is increased by nega- tive skin friction if soil around upper part of pile settles.

U. S. Army Corps of Engineers

(Principles of Geotechnical Engineering, Braja M. Das, 2nd 1941 zand 5th edition, 2002)

Salang Tunnel Substation, Parwan Province, Afghanistan



 $\overline{S_t} = Total \ Settlement$ 

 $S_e = immediate settlement$ 

 $S_c = primary consolidation settlement$ 

 $S_s = secondary consolidation settlement$ 

}≈0

#### immediately Settlement Estimation for this Project According To below.

(Principles of Geotechnical Engineering, Braja M. Das, 2nd edition):For Rigid Foundation:

$$S_e = \frac{Bq_0}{E_s} (1 - \mu^2) \alpha_r$$

Table No: 6. The values of ar for various types of foundation, [Reverence: Berja. M. Das,

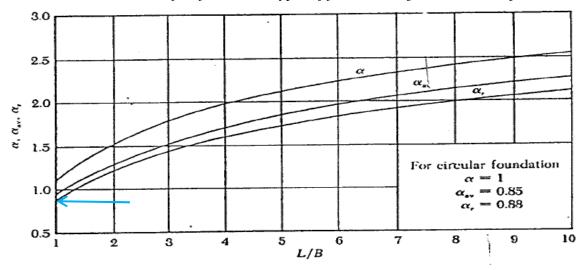


Table no.7. Representative Values of Poisson's Ratio for soils [Reference: Berja. M. Das, 2002, p262, table 10-3]

Soil type	Poisson's Ratio (μs)
Loose sand	0.2-0.4
Medium dense sand	0.25-0.4
Dense sand	0.3-0.45
Silty sand	0.2-0.4
Soft clay	0.15-0.25
Medium dense clay	0.2-0.5

#### Salang Tunnel Substation, Parwan Province, Afghanistan



Table No.8. Representative Values of the Modulus of Elasticity of soils, [Reference: Berja. M. Das, 2002, p262, table 10-2]

	Elasticity Modulus (Es)	
Soil Type	Kg/cm2	KN/m2
Soft clay	18.5-35	1800-3500
Hard clay	60-140	6000-14000
Loose sand	105-280	10000-28000
Dense sand	350-700	35000-70000

$$S_e = \frac{Bq_0}{E_s} (1 - \mu^2) \alpha_r$$

B= width of foundation (1 meter): for Example.

 $q_0$  = net pressure applied or surcharge pressure 217.94 (kN/m2).

Es= module of elasticity (from Representative Values of the Modulus of Elasticity of soils [Reference: Berja. M. Das, 2002, p262, table 10-2]) (Table no:8) = 10000 KN/m2 for Loose sand..

 $\mu$ = Poisson's ratio [Table No.7] = 0.2 for Loose sand.

 $\alpha r = from \ table \ (L/B = 1) \ where \ L \ (length) \ and \ B \ (width) \ of foundation = 0.9 \ [Table \ No.6]$ 

$$S_e = \frac{Bq_0}{E_r} (1 - \mu^2) \alpha_r$$

$$S_e = \frac{1 \times qo}{10000} (1 - 0.2^2) 0.9$$

For B=1m Se=0.01883(m)

#### Final Suggestion for immediate Settlement:

we suggest the estimating settlement by formula:

$$S_e = \frac{Bq_0}{E_s} (1 - \mu^2) \alpha_r$$
  
For  $B = Im Se = 0.01883(m)$ 

Salang Tunnel Substation, Parwan Province, Afghanistan



#### 6.6.Lateral Earth Pressure Calculation

There are categories of lateral earth pressure and each depends upon the movement experienced by the vertical wall on which the pressure is acting.

*The three categories are:* 

- ❖ At rest earth pressure
- ❖ Active earth pressure
- ❖ Passive earth pressure

Calculation of Lateral Earth Pressure Coefficients:

According to the direct shear test result, minimum of friction angle  $(\phi)$  of soil is 33° and Cohesion  $(C) \approx 0.00$ Kpa.

At Rest Earth Pressure Coefficient (K0):  $k_0 = 1 - \sin \phi$ 

$$K_0 = 1 - Sin \emptyset$$
  $\longrightarrow$   $K_0 = 1 - Sin 33 \longrightarrow$   $K_0 = 0.46$ 

Active Earth Pressure Coefficient (Ka):

$$Ka = tan^2 \left[ 45 - \frac{\emptyset}{2} \right] \longrightarrow Ka = tan^2 \left[ 45 - \frac{33}{2} \right] \longrightarrow K_a = 0.29$$

Passive Earth Pressure Coefficient (Kp):

$$Kp = tan^2 \left[ 45 + \frac{\emptyset}{2} \right] \longrightarrow Kp = tan^2 \left[ 45 + \frac{33}{2} \right] \longrightarrow K_p = 3.39$$

Sliding:

$$\mu = \tan \delta = \tan 23 = 0.42$$
 (typical between concrete and soil)

#### 6.7. General Geotechnical Comment and Limitation

Following are the comments and limitations of our report:

- This report presents results of the geotechnical investigations, conducted through 3borehole with 6 meter depth, 7 test pits with3meter depth below the existing grade.
- The analyses, conclusions and recommendations contained in this report are based on site conditions, as they existed at the time of field investigations and further on the assumption that the boreholes and test pits are representative of the subsurface conditions throughout the site.
- This report has been prepared for the construction of Salang Tunnel Substation, Parwan Province, Afghanistan.

Salang Tunnel Substation, Parwan Province, Afghanistan



Paragraphs, statements, test results, boring logs, diagrams etc., should not be taken out of context and should not be utilized for any other structure at any site.

#### 6.8. Conclusions and Recommendations

The following conclusions and recommendations are made based on the results of geotechnical investigations carried out at the Salang Tunnel Substation, Parwan Province, Afghanistan site:

The general sub soils type at the project site per ASTM D-2487-06 (Unified Soil Classification System) standard consist of [SM], [Silty Sand with gravel and Boulder].

a) Final Suggestion for Allowable Bearing Capacity

Allowable Bearing Capacity based on new edition Terzaghi equation, equal to

Qa=2.222 kg/cm<sup>2</sup>.....For B = 1 meter

b) Final Suggestion for immediate Settlement:

we suggest estimating the settlement by formula:

$$S_e = \frac{Bq_0}{E_s} (1 - \mu^2) \alpha_r$$
  
For  $B = 1m Se = 0.01883 (m)$ 

- c) Ground Water Level (GWL) not encountered to the water Table in dig borehole Up to 6 meter below the ground Surface.
- *d)* Based on the subsoil conditions, the proposed buildings may be supported on spread footings placed at a depth not less than 0.8 m depth below the existing ground level.
- *e)* We suggest using all type of foundation such as Single, Strip and Mat footings Suggested with combined Reinforced concrete (R.C) just with considering the calculated Bearing capacity.

Salang Tunnel Substation, Parwan Province, Afghanistan



#### 6.9. Closure

We trust that this report will assist you in the design and construction of the proposed project. Shawal Geotechnical Engineering/Materials Testing Laboratory appreciates the opportunity to provide our services on this project and looks forward to working with you during construction and on future projects. Should you have any questions, please do not hesitate to contact us.

This report was prepared by Shawal Geotechnical Engineering/Materials Testing Laboratory.

This report was prepared in accordance with current, generally accepted geotechnical engineering practices. No other warrantee is provided.

Shawal Geotechnical Engineering/Materials Testing Laboratory should be allowed the opportunity to review the geotechnical aspects of plans and specifications prior to construction, to allow confirmation of the correct interpretation of the recommendations provided in this report.

Salang Tunnel Substation, Parwan Province, Afghanistan



#### 7.References

#### 1) ASTM Standards

- ➤ ASTM D-422 Standard Test Method for Particle-Size Analysis of Soils
- > ASTM D-854 Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer
- > ASTM D-2216 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ➤ ASTM D-2487 Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- ➤ ASTM D-4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ➤ ASTM D-1586 Standard Test Methods for Penetration Test and Split-BarrelSampling of Soils
- ➤ Collapse Potential Test (ASTM D 5333)
- ➤ ASTM D 3080 Standard Test Method for Direct Shear test of soil under Consolidated Drained condition
- ➤ ASTM D 1556 Standard Test Method for density and Unit Weight of soil in place by the Sand Cone Method

#### 2) UNIFIED FACILITIES CRITERIA (UFC)

- ➤ Geotechnical Engineering Procedures for Foundation Designs and Structures
- Soils and Geology Procedures for Foundation design Building and other Structures
- > Soil Mechanics

#### 3) INTERNATIONAL BUILDING CODE (IBC)

- ➤ International building code 2006, section 1804, page 345, Table 1804.2
- 4) Reference Books
  - Principles of Geotechnical Engineering, Braja M. Das, 2nd edition, 1941.
  - ➤ Principles of Geotechnical Engineering, Braja M. Das, 5th edition, 2002.
- 5) And:
- ➤ US Army Corps of Engineers, Afghanistan Engineer District, AED Design Requirements, Geotechnical Investigations (Provisional).

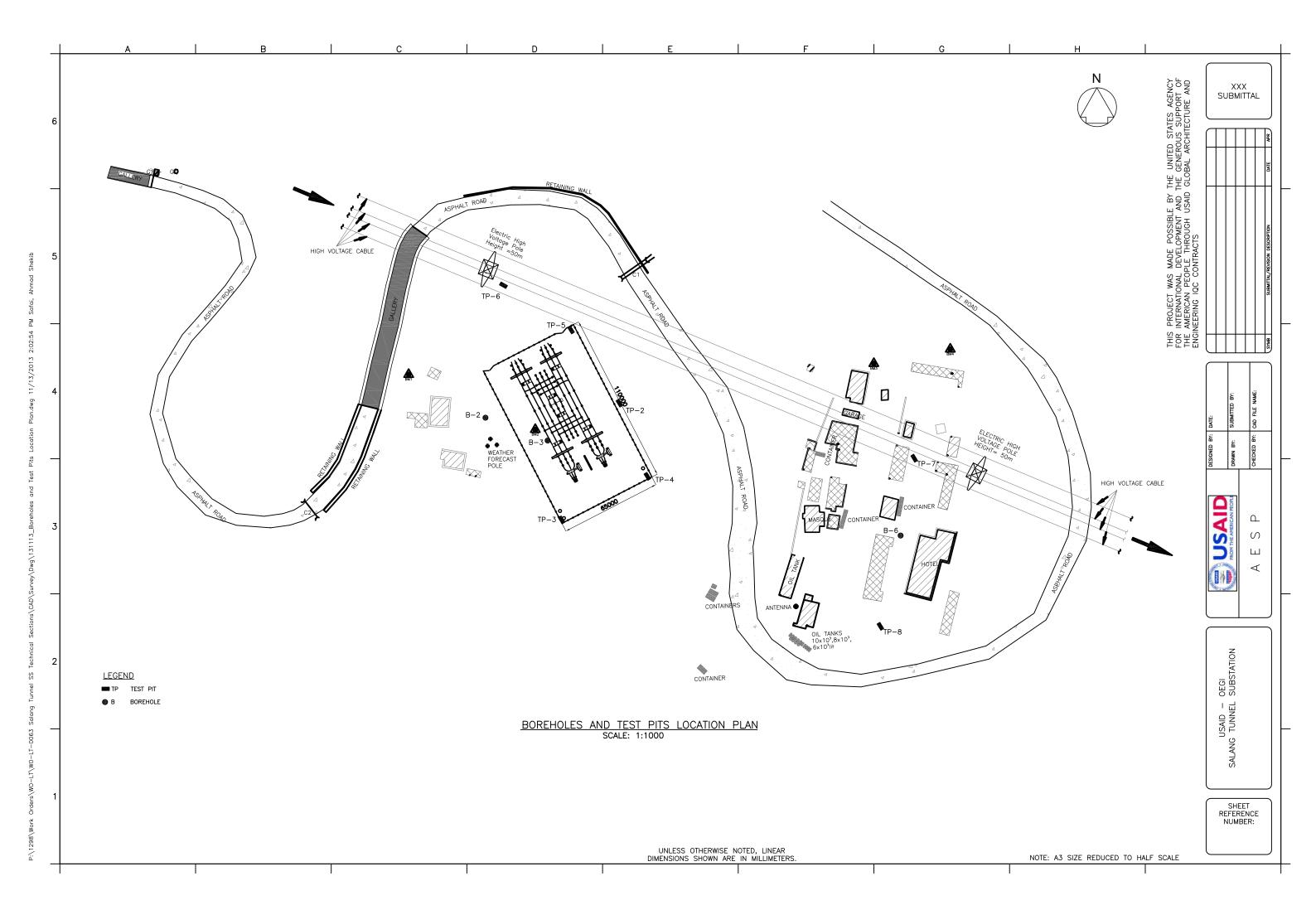


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# Appendix A

Location Map of Boreholes and Test Pits

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# Appendix B

**Boreholes Log** 

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### LOG OF BH# 02

### Completion Depth Of Borehole: 6 (meter)



Cliant	LICAID			l .									
Client : Contractor	USAID	~⊔			ation :		an Province	Coordinates			17'45.90"		
	r: TETRA TEC				ather:	Sunn		Surface Elev			3'43.93"		
Project:			ubstation, Parwan Province, Afghanistan	Dep		6.00	m	Juliace Elev	vations=	321	o m		
Project.			ubstation, Parwan Province, Alghanistan	wat	er Table								
DЕРТН (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION		USCS	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	10		SF 20	PT/ (N VALU 30	E) 40	
0.75—		100	Silty Sand with Gravel		SM	0.75	8-11-15-(26)				0		
1.5 —		100	Refusal Border			1.5	Refusal						
2.25—		100				2.25	Refusal						
3 -		100	Boulder			3	Refusal						
3.75—		100	Assumed			3.75	Refusal						
4.5 —						4.5	Refusal						
5.25—		100				5.25	Refusal						
	1					6	Pofusal						
6						<u>l 6</u> NOTE	Refusal	1	I				
Remarl	K							II CAMDIT	: DECC	\/CD	ED EDOM	1	
1					1-	CONT	INUAL SO	IL SAMPLE	: KECO	vER	KED FROM	1	

BOREHOLE AND STORED IN WOODEN BOXES.

Geotechnical Engineer: Eng.Enayatullah

Geotechnical Rotary Core Drilling (ASTM D-2113)

63.5-Kg/30 inch drop-Split Spoon via ASTM D-1586

Continuous Soil Sampling - Split Spoon

Drilling Method:

SPT Hammer:

Sampling Method:

### LOG OF BH# 03

### Completion Depth Of Borehole: 6 (meter)



							1					
Client :	USAID	-11			ation :		an Province	Coordinates				
Contractor					ather:	Sunn		Cfa		° 3'44.70"		
	ractor :Shawal GN			Dep		6.00	m	Surface Elev	/ations=320	J7 M		
Project:			ubstation, Parwan Province, Afghanistan	Wat	er Tabl							
DEРТН (M)		CORE RECOVERY (%)	MATERIAL DESCRIPTION		USCS	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	10		SPT/ (N VAL		
		100	Silty Sand with Gravel		SM							
0.75—		100	Refusal Border			0.75	6-13-14-(27)			0		
1.5 —		100				1.5	Refusal					
2.25—		100				2.25	Refusal					
3 -		100	Boulder Assumed			3	Refusal					
3.75—		100				3.75	Refusal					
4.5 —						4.5	Refusal					
5.25—		100				5.25	Refusal					
6						6	Refusal					
Remarl	k					NOTE						
					1-	CON1	INUAL SC	IL SAMPLE	RECOVE	ERED FRO	М	

BOREHOLE AND STORED IN WOODEN BOXES.

Geotechnical Rotary Core Drilling (ASTM D-2113)

63.5-Kg/30 inch drop-Split Spoon via ASTM D-1586

Continuous Soil Sampling - Split Spoon

Drilling Method:

SPT Hammer:

Sampling Method:

### LOG OF BH# 06

### Completion Depth Of Borehole: 6 (meter)



Client:	USAID			Loca	ation :	Parwa	n Province	Coordinates	s N= 35°	17'43.79"		
Contractor	r: TETRA TE	СН			ather:	Sunn				° 3'54.90"		
Sub-Contr	actor:Shawal G	MTL.		Dep	th:	6.00 ו	m	Surface Elev	vations= 316	6 m		
Project:	Salang Tu	nnel S	ubstation, Parwan Province, Afghanistan	Wat	er Table							
DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION		USCS	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	10		PT/ (N VALU	E) 40	
0.75-		100	Silty Sand with Gravel		SM	0.75	9-11-14-(25)			0		
4.5		100	Refusal Border			4.5	5.4					
1.5 —		100				1.5	Refusal					
2.25-		100				2.25	Refusal					
3 -		100				3	Refusal					
3.75-		100	Boulder Assumed			3.75	Refusal					
4.5 —						4.5	Refusal					
5.25—		100				5.25	Refusal					
6		100				6	Refusal					
Remar						NOTE						
Norman								IL SAMPLE				
							Mothod .	STORED	obnical Date			D 2442)

Drilling Method:

SPT Hammer : Geotechnical Engineer

Sampling Method:

Geotechnical Rotary Core Drilling (ASTM D-2113)

63.5-Kg/30 inch drop-Split Spoon via ASTM D-1586

Continuous Soil Sampling - Split Spoon



Shawal Geotechnical Engineering /Materials Testing Laboratory

# Appendix C

Test Pits Log

Shawal Geotechnical & Material Testing Laboratory

#### LOG OF TP# 02

USAID

Client:

Remark...

#### Completion Depth Of Test Pit: 3 (meter)



Coordinates N= 35°17'46.52"

Contractor: TETRA TECH E= 69° 3'47.33" Weather: Sunny Sub-Contractor: Shawal GMTL. Surface Elevations= 3200 m Depth: 3.00 m Project Salang Tunnel Substation, Parwan Province, Afghanistan Water Table: Dry CORE RECOVERY
(%) USCS CLASSIFICATION Depth of SPT Test (m) GRAPHIC LOG BLOW COUNTS (N VALUE) DEPTH (M) MATERIAL SPT/ (N VALUE) DESCRIPTION 10 20 30 40 100 MLSilt 0.75 0.75 1.00. 100 1.5 1.55 100 2.00 ML Silt with sand 2.25 2.25 100 3 3.00

Location:

Parwan Province

NOTE

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method: By Excavator Machine
Sampling Method: By Hand / Field Technician
SPT Hammer: 140-lb/30in-Auto Drop

SS: Split Spoon soil Sampling (ASTM D-1586)

### LOG OF TP# 03

USAID

Client :

Remark...

### Completion Depth Of Test Pit: 3 (meter)



Coordinates N= 35°17'44.19"

Contractor		ather:	Sunn	v		E= (	69° 3'46.05"				
Sub-Contr	actor: Shawal GN	ITL.		Dep		3.00 ו		Surface Ele	vations= 3	200 m	
Project:	Salang Tun	nel Su	ubstation, Parwan Province, Afghanistan		ter Table	e: Dry					
DEРТН (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION		USCS	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	10		PT/ (N VALU 30	
0.75		100	Silty Sand with gravel		SM	0.75					
2.00 <u> </u>		100	Refusal Border  Boulder Assumed			2.25					

Location: Parwan Province

AND REVIEWED BY LAB MANAGER. Excavation Method: By Excavator Machine Sampling Method: By Hand / Field Technician

SPT Hammer : 140-lb/30in-Auto Drop

Split Spoon soil Sampling (ASTM D-1586)

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING

#### LOG OF TP# 04

Client:

Remark...

USAID

#### Completion Depth Of Test Pit: 3 (meter)



Coordinates N= 35°17'44.95"

E= 69° 3'48.01" Contractor: TETRA TECH Weather: Sunny Surface Elevations= 3192 m Sub-Contractor: Shawal GMTL. Depth: 3.00 m Project: Salang Tunnel Substation, Parwan Province, Afghanistan Water Table: Dry CORE RECOVERY
(%) USCS CLASSIFICATION Depth of SPT Test (m) **SRAPHIC LOG** DEPTH (M) MATERIAL SPT/ (N VALUE) DESCRIPTION 10 20 30 40 100 0.75 0.75 1.00-SM Silty Sand with gravel 100 1.5 1.55 100 2.00 2.25 2.25 Refusal Border 100 Boulder Assumed 3 3.00

Location:

Parwan Province

1 11711

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method : Sampling Method :

By Excavator Machine By Hand / Field Technician

SPT Hammer:

140-lb/30in-Auto Drop Split Spoon soil Sampling (ASTM D-1586)

### LOG OF TP# 05

USAID

Client :

Remark...

### Completion Depth Of Test Pit: 3 (meter)



Coordinates N= 35°17'48.03"

Contractor:		Wea	ather:	Sunn	у		E= 6	69° 3'45.64"					
Sub-Contractor	: Shawal GM	ITL.		Dep	th:	3.00 ו	m	Surface Elevations= 3213 m					
Project:			ıbstation, Parwan Province, Afghanistan	Wat	ter Tabl								
DЕРТН (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION		USCS	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	10		PT/ (N VALU 30			
0.75		100	Silty Sand with gravel		SM	0.75							
2.00		100	Refusal Border  Boulder Assumed			2.25							

Location: Parwan Province

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Sampling Method:

Excavation Method: By Excavator Machine By Hand / Field Technician

SPT Hammer :

140-lb/30in-Auto Drop

Split Spoon soil Sampling (ASTM D-1586)

### LOG OF TP# 06

USAID

Client :

Remark...

### Completion Depth Of Test Pit: 3 (meter)



Coordinates N= 35°17'48.39"

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING

140-lb/30in-Auto Drop

By Hand / Field Technician

Split Spoon soil Sampling (ASTM D-1586)

AND REVIEWED BY LAB MANAGER.

Excavation Method: By Excavator Machine

Sampling Method :

Geotechnical Engineer:

SPT Hammer :

Sub-Contractor: Shawal GMTL.  Project: Salang Tunnel Substation, Parwan Province, Afghanistan  MATERIAL DESCRIPTION  Depth: 3.00 m Water Table: Dry  MATERIAL DESCRIPTION  SPT/ (N VALUE)  100  0.75  1.00  100	ntractor: TETRA TECH	Weather: Su	ınny	E= 69° 3'43.97"				
(W) Had Barrier Description (W	o-Contractor: Shawal GMTL.	Depth: 3.	00 m	Surface Elevations=	3205 m			
0.75								
0.75	GRAPHIC LOG GRAPHIC LOG GRAPHIC LOG (%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	USCS	Depth of SPT Test (m) BLOW COUNTS (N VALUE)					
1.55   100   2.00 — 2.25   2.25   3.00   3	1.00 Silty Sand with grav	SM 1	.5					

Location: Parwan Province

#### LOG OF TP# 07

Client:

Remark...

USAID

#### Completion Depth Of Test Pit: 3 (meter)



Coordinates N= 35°17'45.30"

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING

By Excavator Machine

140-lb/30in-Auto Drop

By Hand / Field Technician

Split Spoon soil Sampling (ASTM D-1586)

AND REVIEWED BY LAB MANAGER.

Excavation Method:

Geotechnical Engineer

Sampling Method:

SPT Hammer:

Contractor: TETRA TECH 69°3'55.39" Weather: Sunny Sub-Contractor: Shawal GMTL. Surface Elevations= 3164 m Depth: 3.00 m Project: Salang Tunnel Substation, Parwan Province, Afghanistan Water Table: Dry CORE RECOVERY
(%) USCS CLASSIFICATION Depth of SPT Test (m) GRAPHIC LOG **DEPTH (M)** MATERIAL SPT/ (N VALUE) DESCRIPTION 10 20 30 40 100 0.75 0.75 1.00-100 SM Silty Sand with gravel 1.5 1.55 100 2.00 2.25 2.25 100 3 3.00

Location:

Parwan Province

#### LOG OF TP# 08

Client:

USAID

#### Completion Depth Of Test Pit: 3 (meter)



Coordinates N= 35°17'42.10"

Contractor: TETRA TECH E= 69° 3'53.98" Weather: Sunny Surface Elevations= 3163 m Sub-Contractor: Shawal GMTL. Depth: 3.00 m Project: Salang Tunnel Substation, Parwan Province, Afghanistan Water Table: Dry CORE RECOVERY
(%) USCS CLASSIFICATION Depth of SPT Test (m) **SRAPHIC LOG** DEPTH (M) MATERIAL SPT/ (N VALUE) DESCRIPTION 10 20 30 40 100 0.75 0.75 SM Silty Sand with gravel 1.00-100 1.5 1.55 Refusal Border 100 2.00 2.25 2.25 Boulder Assumed 100 3 3.00

Location:

Parwan Province

Remark...

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method: Sampling Method:

By Excavator Machine

By Hand / Field Technician 140-lb/30in-Auto Drop

SPT Hammer:

Split Spoon soil Sampling (ASTM D-1586)



Shawal Geotechnical Engineering /Materials Testing Laboratory

# Appendix D

Field Test Results

Shawal Geotechnical & Material Testing Laboratory



#### Shawal Geotechnical Engineering / Materials Testing Labora

#### Field Density Test for Soil ASTM D 1556

	•	<u> </u>							
Project Name	Geotechnical E	xplorationn fo	or Salang Tunn	el Substation,	Afghanistan Contractor TETRA			ETRA TECH	
Project Location	Parvan Province	e, Salang Tun	nel Substation	ı		Client	Client USAID		
sample location	TP No. (2, 3,5,6	,7)				Project No.	KSC-229		
Lo	ocation	TP-2	TP-3	TP-5	TP-6	TP-7			
Determinat	ion of Moisture	inSoils by Mea	ıns of a Calciui	m Carbide Gas	Pressure Moi	sture Tester AA	SHTO T-217 ,	ASTM D 4944	
Percent of I on Wet Mas	Moistur Based	3.9	4.0	4.1	3.7	4.3			
Percent of I on Dry Mas	Moistur Based	4.06	4.2	4.3	3.8	4.5			
				Field Density					
	Depth m	0.75	0.75	0.75	1.5	1.5			
F	Pit No.	TP-2	TP-3	TP-5	TP-6	TP-7			
Field density	У								
			•						
Wt. of wet m	naterial from hole	5147	5063	5264	5044	5213			
Wt. of sand +cy	linder before Pouring	8000	8000	8000	8000	8000			
Wt. of sand +cy	linder after Pouring	2198	2258	2134	2284	2133			
Wt. sand in	cone	1650	1650	1650	1650	1650			
Wt. sand in	Hole	4152	4092	4216	4066	4217			
Bulk density	of sand	1.399	1.399	1.399	1.399	1.399			
Volume of sa	and in hole	2968	2925	3014	2906	3014			
Wet Density	′	1.734	1.731	1.747	1.736	1.729			
Result									
Dry Density		1.667	1.662	1.675	1.671	1.655			
	1					1			
Tested by					Signature				
Date									
Checked By Date					Signature				
Date	1				I	1			



SPT BLOWS										
PROJEC	T Name:	Geotechnical Exploration	n for Salang Tunnel Subst	ation, Afghanistan						
LOCATIO	ON	Parvan Province, Salar	ng Tunnel Substation							
CLIENT		USAID								
CONTRA	CTOR	TETRA TECH		Date SPT Record:	9-Nov-13					
			SPT BI	ows						
BH No.	Depth m	15cm	30cm	45cm	" N Value"					
	0.75	8	11	15	26					
	1.50		Refu							
	2.25		Refu							
BH No.2	3.00		Refu							
DITINO.2	3.75		Refu							
	4.50		Refu							
	5.25		Refu							
	6.00 0.75		Refu		27					
-	0.75 6 13 14 27 1.50 Refusal									
2.25 Refusal										
-	3.00		Refus							
BH No.3	3.75		Refus							
}	4.50		Refu							
-	5.25		Refu							
	6.00		Refus							
	0.75	9	11	14	25					
<u> </u>	1.50		Refus	sal						
<u> </u>	2.25		Refus	sal						
DII N. C	3.00		Refu	sal						
BH No.6	3.75		Refu							
	4.50		Refu							
	5.25		Refu							
	6.00		Refu	sal						
	End of Test BH									
Explanatio	Explanations:									
Name	& Signature	Field Data Logged by:	Prepared & Checked by:		Reviewed by:					
	Date									



			SPT BLOWS							
PROJEC	T Name:	Geotechnical Exploration	n for Salang Tunnel Sub	station, Afghanistan						
LOCATIO	ON	Parvan Province, Salar	ng Tunnel Substation							
CLIENT		USAID								
CONTRA	ACTOR	TETRA TECH		Date SPT Record:	9-Nov-13					
			SPT BI							
TP No.	Depth m	15cm	30cm	45cm	" N Value"					
	0.75	6	14	21	35					
TD No 3	1.50	7	13	24	37					
TP No.2	2.25	5	16	23	39					
	3.00	6	14	26	40					
	0.75	6	13	22	35					
TP No.3	1.50	8	12	24	36					
17 NO.3	No.3 2.25 Refusal									
	3.00		Retu	sal						
	0.75	7	16	19	35					
TD N = 4	1.50	8	13	25	38					
TP No.4	2.25	9	18	22	40					
	3.00		Refu							
	0.75	8	14	22	36					
	1.50	7	15	22	37					
TP No.5	2.25		Refu							
=	3.00		Refu	sal						
	0.75	8	11	15	26					
<b>T</b> D 11 C	1.50	7	14	19	33					
TP No.6	2.25	8	15	20	35					
=	3.00	9	16	22	38					
	0.75	7	10	16	26					
TD N = 7	1.50	6	9	19	28					
TP No.7	2.25	5	11	18	29					
	3.00	8	12	26	38					
	0.75	8	11	19	30					
TD N = 0	1.50	7	13	21	34					
TP No.8	2.25		Refu							
	3.00		Refu	sal						
			End of Test Pit							
Explanation	ons:									
Name	& Signature	Field Data Logged by:	Prepared & Checked		Reviewed by:					
	Date		L							



Shawal Geotechnical Engineering / Materials Testing Laboratory

# Appendix E

Test Pits Laboratory Soil Test Results

Shawal Geotechnical & Material Testing Laboratory

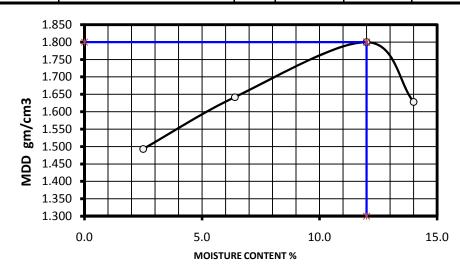


Client.			USAI	D				Cont	tractor.	TE	TRA TECH		Job	No.	GC	) -21	
Projec	t.		Geote	chnical Explorati	onn for Salang Tun	nel Substation, Afgl	nanistan	Proje	ect No.	KS	C-229		Sar	nple Date.	11/1	11/10/2013	
Projec	t Locat	ion.	Parva	an Province, Sa	ang Tunnel Subs	tation		Subn	nitted to.	TE	ra tech		•				
Materi	ial Sour	ce.	Test I	Pit No # 2				Soil I	Descoription.	Silt							
Test P	it No.		TP#	2	Witn	essed by.		Contr	ractor Rep.	San	npled by.		Sha	wal Lab by Fie	eld Team,		
Depth	of ( M )		0.75 ı			. Represented,			g Aprox (50 KG)								
		SIE	VE /	ANALYSIS (	OF GRANULA	AR SOILS (AS	TM D 4	422)			TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LIN	IIT OF SOIL	(ASTM D 43	318)	
A W	t. of Dr	y Sample	Before	e Washing			g	ı	1952.0	Α	Container No		4 D	2 D	3 D	4 D	
B W	t. of Dr	y Sample	After '	Washing			g	ı	246.7	В	Number of Bumps						
C W	t. of Ma	at'ls Loss	During	g Washing (A -	B)		g	ı	1705.3	С	Mass of Wet Soil and Container	g				_	
D %	tage of	Mat'ls Pa	ssing	75µm (no. 200)			g	ı	87.4	D	Mass of Dry Soil & Container	g			ASTILO	)	
E N	atural M	loisture C	ontent	t			%		3.6	Е	Mass of Container	g				,	
	Sieve	Size		Weigth		% of	Whole	NO.	SDECIEIC ATION	F	Mass of Moisture (C - D)	g					
In	ch	mm		Ret CUM(g)	% fo retained	Passing	% Pas		SPECIFICATION	G	Mass of Dry soil (D - E)	g					
:	3	76.2	2	0	0	100.0	100	0		Н	Moisture Content (F / G) x 100	%					
2 ′	1/2	63		0	0	100.0	100	0			PL	AS7	TIC LIMIT	-			
2	2	50		0	0.0	100.0	100	0		Α	Container No		4 D	4 D	Avera	ge	
1 1	1/2	37.5	;	0	0.0	100.0	100	0		C	Mass of Wet Soil and Container	g					
	1	25		0	0.0	100.0	100	0		D	Mass of Dry Soil & Container	g					
	/4	19		0	0.0	100.0	100	0		Е	Mass of Container	g					
1,	/2	12.5	;	0	0.0	100.0	100	0		F	Mass of Moisture (C - D)	g					
3,	/8	9.5		0	0.0	100.0	100	0		G	Mass of Dry soil (D - E)	g					
-	/4	6.3		2.7	0.1	99.9	100			Н	Moisture Content (F / G) x 100	%					
	4	4.75		6.7	0.3	99.7	100			CL	ASSIFICATION OF SOIL ASTM D 2	2487		(ML)	Silt		
	10	2.00		37.2	1.9	98.1	98										
	40	0.42		119.5	6.1	93.9	94				No of Blows / Moisture	Con	tent		nary of LL,F		
	100	0.15		198.1	10.1	89.9	90					$\pm$	##	LL @ 25 Blov	WS	NP	
# 2	200	0.07		245.8	12.6	87.4	87		of C. Amalysia	(%)	31.0			Plastic Limit		NP	
	100	P	artic	le Size Distric	lution Curve	<u>^T</u> YYYT		nary c	of S,Analysis			#	##	Plasticity Inde		NP	
	90		Ш위			<del>                                     </del>	Gravel		0.0 %	onti	29.0 NONPLAST	-14			DENSITY (AS	IM D1557)	
% Passing Sieve	80 70						Sand		13.0 %	OBL	25.0			OMC %			
Š	60			<del>                                     </del>		<del>                                     </del>	%200 Si		87.0 %	stu	25.0			MDD g/cc	2 /4 OTM D4/	100)	
lig	50		+++++	<del>                                     </del>	<del>-                                     </del>	<del>                                     </del>	N.Moistu		3.6	Mo	23.0	$\pm$			R (ASTM D18	(83)	
ass	40 30								TICALE SIZE		21.0	+		CBR Det. @			
%	20	+	+ + + + + + + + + + + + + + + + + + +					DIAIVII	ETERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDATION OF THE CONSOLIDATION OF THE CONSOLIDATION OF THE CONSOLIDATION OF THE CONSOLIDATION OF THE CONSOLIDATION OF THE CONSOLIDATION OF T			
	10	+++	++++			<del>1   1   1   1   1  </del>	D 60				Humber of Blows			CONSOLIDA	TION		
	0	+		<del>                                     </del>		<del>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </del>	D 30							ا ما	h Managas		
	C	0.01	0	.1 1	10		D 10							La	b.Manager		
										<u> </u>							



# Shawal GEMTL Shawal GMTL Shawal GMTL Shawal GMTL Shawal GMTL

			#					
Client.	USAID					Job No.		Scl -2
Project	Geotechnical Explorationn for Sa	lang Tuni	nel Substatio	n		Testing Date.		11/10/2013
Contractor	TETRA TECH					Sampled by.	Shawal	
Contract No	o. KSC-229					Witnessed by.		Contractor Rep.
Location	Test Pit No # 2	De	epth(m)	0.7	′5 M			•
Line	Proctor		1	2	3	4	5	6
Α	Mass of Mould, Base & Specimen	gm	9623	10083	10655	10315		
В	Mass of Mould & Base plate	gm	6370	6370	6370	6370		
С	Mass of Specimen, (A - B)	gm	3253	3713	4285	3945		
D	Wet Density,W1 =(A-B)/ volume	gm/cm <sup>3</sup>	1.530	1.747	2.016	1.856		
Line	Moisture Content Determination		1	2	3	4	5	6
Е	Container No.	no	C - 9	C - 4	C-7	C - 12		
F	Mass of Wet Soil & Container	g	284.6	566.4	279.5	297.5		
G	Mass of Dry Soil & Container	g	278.6	534.7	255.4	266.8		
Н	Mass of Container	g	40.6	38.6	54.2	47.5		
I	Mass of Moisture, (F - G)	g	6.0	31.7	24.1	30.7		
J	Mass of Dry Soil, (G -H)	g	238.0	496.1	201.2	219.3		
K	Moisture Content, $w = (I/J)x100$	%	2.5	6.4	12.0	14.0		
Line	Dry Density of Soil		1	2	3	4	5	6
L	Dry Density, W= [D/(K+100)]x100	gm/cm <sup>3</sup>	1.493	1.642	1.800	1.628		
М	Dry Density, W= (L*62.43)	PCF	93.2	102.5	112.4	101.6		



TEST METHOD	ASTM D-1557
DROP HEIGHT	18in/457 mm
COMPACTION TYPE	Manual
RAMMER WEIGHT	4.54 Kg
MOULD WEIGHT gm	6370
MOULD VOLUME gm/cm <sup>3</sup>	2125.4
BLOWS/LAYER	56
(OMC)%	12.0
(MDD) gm/cm <sup>3</sup>	1.800
(NMC)%	4.3

Lab Manager QC



1								
USAID							Date Sampled :	11/10/2013
		orationn for	Salang 1	Tunnel			Contractor.	TETRA TECH
Test Pit N	lo # 2	Depth o	of (M)	0.75	m			
Densi	ty Calcul	ation of Me	ould					Graphics:
10 B	lows	30 BI	ows	65 BI	ows		10 Blo	ows Chart
	1	2		3		45.0	10 210	onare and a second a second and
A) 108	24.2	1113	34.0	1088	0.6			
3) 687	72.0	695	7.0	6690	0.0	30.0		
B) 395	52.2	417	7.0	4190	0.6	50 25.0 P		
·	5.3	395	5.6	339	1.7	15.0		-
		<b></b>		<b>}</b>		10.0		
		<del></del>		<b>{</b>		5.0		
		<b> </b>		1		0.0 0	1 2 3	4 5 6 7 8
		ļ		ļ			Pe	netration mm
_ <del> </del>		į		<del> </del>		22.2	30 Blo	ows Chart
		<del></del>		i				
		ļ		ļ		50.0		
			40	1 1.82	23	40.0		
		<del>,                                    </del>	ows	65 BI	ows	30.0 -		
102	10113	30 51	OW3	00 11		20.0		
0	.0	0.0	0	0.0	<b>J</b>	10.0 -		
0	.0	0.0	00	0.0	10	0.0	1 2 3	4 5 6 7 8
0.			00	0.0	10		Penet	ration mm
n Record			19.354	R.F =	4.24	000	65 Blo	ow Chart
10 B		,	ows	65 BI	ows			
Readings	Load kg/cm²	Readings	Load kg/cm²	Readings	Load kg/cm²	60.0		
0.0	0.0	0.0	0.0	0.0	0.0	50.0		
<del>j</del>	<del> </del>	18.0	3.9	13.0	2.8	<b>3</b> 40.0 −		
	<del> </del>	ł	6.1	41.0	0.0	1 0		
35.0	7.67			í		<b>Load</b> 30.0		
	<del></del>	62.0	13.6	78.0	17.1	30.0 - 20.0 -		
62.0	13.6	76.0	16.6	95.0	17.1 <b>20.8</b>			
78.0	<b>13.6</b> 17.09	76.0 98.0	<b>16.6</b> 21.5	95.0 141.0	17.1 <b>20.8</b> 30.9	20.0		
78.0 99.0	13.6 17.09 21.7	76.0 98.0 101.0	16.6 21.5 22.1	95.0 141.0 157.0	17.1 20.8 30.9 34.4	20.0	1 2 3	4 5 6 7 8
78.0 99.0 156.0	13.6 17.09 21.7 34.18	76.0 98.0 101.0 182.0	16.6 21.5 22.1 39.9	95.0 141.0	17.1 <b>20.8</b> 30.9	20.0 — 10.0 —		4 5 6 7 8 tration mm
78.0 99.0 156.0 <b>SUM</b> I	13.6 17.09 21.7 34.18 MARY C	76.0 98.0 101.0	16.6 21.5 22.1 39.9 EST	95.0 141.0 157.0 212.0	17.1 20.8 30.9 34.4 46.4	20.0 — 10.0 —	Pene	tration mm
78.0 99.0 156.0 <b>SUMI</b>	13.6 17.09 21.7 34.18	76.0 98.0 101.0 182.0	16.6 21.5 22.1 39.9 EST	95.0 141.0 157.0	17.1 20.8 30.9 34.4 46.4	20.0 — 10.0 —	Pene	
78.0 99.0 156.0 SUMI 10-B	13.6 17.09 21.7 34.18 MARY Colows	76.0 98.0 101.0 182.0 <b>PF CBR TI</b>	16.6 21.5 22.1 39.9 EST ows	95.0 141.0 157.0 212.0	17.1 20.8 30.9 34.4 46.4 ows	20.0	Pene	tration mm
78.0 99.0 156.0 <b>SUMI</b> 10-B	13.6 17.09 21.7 34.18 MARY Colows	76.0 98.0 101.0 182.0 F CBR TI 30-BI	16.6 21.5 22.1 39.9 EST ows	95.0 141.0 157.0 212.0 65-Bl	17.1 20.8 30.9 34.4 46.4	20.0	Pene	tration mm
78.0 99.0 156.0 <b>SUMI</b> 10-B	13.6 17.09 21.7 34.18 MARY Colows 3.6	76.0 98.0 101.0 182.0 F CBR TI 30-BI 16.	16.6 21.5 22.1 39.9 EST ows	95.0 141.0 157.0 212.0 65-Blo 20.	17.1 20.8 30.9 34.4 46.4	20.0 10.0 0.0 0 35.0 30.0	Pene	tration mm
78.0 99.0 156.0 SUMI 10-B 13 21	13.6 17.09 21.7 34.18 MARY Colows 3.6	76.0 98.0 101.0 182.0 F CBR TI 30-BI 16.	16.6 21.5 22.1 39.9 EST ows 6	95.0 141.0 157.0 212.0 65-Blo 20.	17.1 20.8 30.9 34.4 46.4	20.0 10.0 0.0 0 35.0 30.0	Pene	tration mm
78.0 99.0 156.0 <b>SUM</b> 10-B 13 21	13.6 17.09 21.7 34.18 MARY Colows 3.6	76.0 98.0 101.0 182.0 F CBR TI 30-BI 16. 22.	16.6 21.5 22.1 39.9 EST ows 6 .1	95.0 141.0 157.0 212.0 65-Blo 20.	17.1 20.8 30.9 34.4 46.4	20.0	Pene	tration mm
78.0 99.0 156.0 <b>SUM</b> 10-B 13 21	13.6 17.09 21.7 34.18 MARY Colows 3.6	76.0 98.0 101.0 182.0 F CBR TI 30-BI 16. 22. 23.	16.6 21.5 22.1 39.9 EST ows 6 .1	95.0 141.0 157.0 212.0 65-Blo 20.	17.1 20.8 30.9 34.4 46.4	35.0 - 30.0 - 35.0 - 30.0 - 35.0 - 30.0 - 35.0 - 30	Pene	tration mm
78.0 99.0 156.0 SUMI 10-B 13 21	13.6 17.09 21.7 34.18 MARY Colows 3.6	76.0 98.0 101.0 182.0 F CBR TI 30-BI 16. 22. 23.	16.6 21.5 22.1 39.9 EST ows 6 .1	95.0 141.0 157.0 212.0 65-Blo	17.1 20.8 30.9 34.4 46.4	35.0 - 30.0 - 35.0 - 30.0 - 35.0 - 30.0 - 35.0 - 30.0 - 35.0 - 36	CBR & Dry	density Chart
78.0 99.0 156.0 SUMI 10-B 13 21	13.6 17.09 21.7 34.18 MARY C lows 3.6 1.7	76.0 98.0 101.0 182.0 F CBR TI 30-BI 16. 22. 23.	16.6 21.5 22.1 39.9 EST ows 6 .1	95.0 141.0 157.0 212.0 65-Bl 20. 34.	17.1 20.8 30.9 34.4 46.4	35.0 - 30.0 - 35.0 - 30.0 - 35.0 - 30.0 - 35.0 - 30.0 - 35.0 - 36	CBR & Dry	tration mm
) )	Substatio  Test Pit N  Densi  (A) 108  B) 687  B) 398  pple 41  pole 37  40  40  40  33  1.6  5  pn 10 B  0  0  0.  n Record  10 B  Readings  0.0  9.0  15.0	Substation   Test Pit No # 2   Density Calcul   10 Blows   1	Substation   Test Pit No # 2   Depth of	Substation   Test Pit No # 2   Depth of ( M )	Test Pit No # 2   Depth of ( M )   0.75	Test Pit No # 2   Depth of ( M )   0.75 m	Substation   Test Pit No # 2   Depth of ( M )   0.75 m	Substation   Test Pit No # 2   Depth of (M)   0.75 m



Clie	nt.		USAII	D				Co	entractor.	TE	TRA TECH		Job	No.	G	0 -21
Proj	ject.		Geote	chnical Exploration	nn for Salang T	unnel Substation, Afg	ghanist	an <b>Pr</b>	oject No.	KS	C-229		Sar	nple Date.	11/1	0/2013
Proj	ject Locat	tion.	Parva	n Province, Sala	ng Tunnel Su	ostation		Su	bmitted to.	TE	TRA TECH					
Mate	erial Soul	rce.	Test F	Pit No # 2				So	il Descoription.	Silt	with sand					
Test	t Pit No.		TP # 2	2	Wi	tnessed by.		Co	ntractor Rep.	San	npled by.		Sha	awal Lab by Fie	eld Team,	
Dep	th of (M	)	1.50 n	n	Q1	Y. Represented,		1 E	Bag Aprox (50 KG)							
		SIE	VE A	ANALYSIS O	F GRANUI	AR SOILS (A	STM	D 422	)		TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LIN	IIT OF SOIL	(ASTM D 4	318)
Α	Wt. of Dr	y Sample I	Before	e Washing				g	1558.0	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After \	Nashing				g	243.5	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss [	During	Washing (A - E	3)			g	1314.5	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 7	75µm (no. 200)				g	84.4	D	Mass of Dry Soil & Container	g	AND.	antai	Laati	<b>a</b>
Е	Natural M	loisture Co	ontent					%	4.9	Е	Mass of Container	g		ON PI		<u>C</u>
	Sieve	e Size		Weigth		% of	Wh	nole NO.	CDECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	d Passing	%	Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		0	0	100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		0	0	100.0		100				AST	IC LIMIT	•	-	-
	2	50		0	0.0	100.0		100		Α	Container No		4 D	4 D	Aver	age
	1 1/2	37.5		0	0.0	100.0		100		С	Mass of Wet Soil and Container	g				
	1	25		0	0.0	100.0		100		D	Mass of Dry Soil & Container	g				
	3/4	19		0	0.0	100.0		100		Е	Mass of Container	g				
	1/2	12.5		0	0.0	100.0		100		F	Mass of Moisture (C - D)	g				
	3/8	9.5		0	0.0	100.0		100		G	Mass of Dry soil (D - E)	g				
	1/4	6.3		6.5	0.4	99.6		100		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75		9.5	0.6	99.4		99		CI	ASSIFICATION OF SOIL ASTM D 2	2487		(ML)	Silt with	sand
	# 10	2.00		37.9	2.4	97.6	<u> </u>	98								
	# 40	0.425		214.6	13.8	86.2	<u> </u>	86			No of Blows / Moisture	Con	tent		nary of LL,	•
_	# 100	0.150		225.6	14.5	85.5		86		-	33.0	+	##	LL @ 25 Blov	vs	NP
<u> </u>	# 200	0.075		246.8	15.8	84.2	_	84	and O American	(%)	31.0			Plastic Limit		NP
	100	P;	articl	e Size Distridu		~~~			of S,Analysis					Plasticity Inde		NP
	90	+++			<del>-                                      </del>	<del>-                                     </del>	Grav		1.0 %	onte	29.0 NON PLAS	110			DENSITY (AS	TM D1557)
, ve	80 70						Sand		15.0 %	Sec	350	H	#	OMC %		
Sie	60						-	) Sieve	84.0 %	stur	25.0	#	##	MDD g/cc		
ing	50	+++		<del>                                     </del>	<del>-                                     </del>	<del>-                        </del>		isture	4.9	Moi	25.0	+			R (ASTM D1	883)
% Passing Sieve	40 30	+++		<del>                                     </del>	<del>-                                      </del>	<del>-                                     </del>	T		RTICALE SIZE		21.0	$\pm$	##	CBR Det. @		
% P	20							DIA	METERS		10.0 Number of Blows		100.0	% EXPANSION		
	10	+++			<del>-                                     </del>	<del> - - -    </del>	D 60			5	Number of blows			CONSOLIDA	TION	
	0	+++	ШШ	<del>                                     </del>			D 30									
	(	0.01	0.	.1 1	10		D 10							<u>La</u>	b.Manage	<u>r</u>
										<u> </u>						



	nt.		USAI	ID						C	ontractor.	TE.	ΓRA TECH		Job	No.	G	O -21
Proj	ect.		Geote	echnical Ex	ploratio	onn for S	Salang Tur	nnel Substation, A	ghanista	an <b>Pr</b>	oject No.	KS	C-229		San	nple Date.	11/	10/2013
Proj	ect Locat	ion.	Parva	an Provinc	e, Sala	ang Tui	nnel Sub	station		Sı	ubmitted to.	TE	FRA TECH				•	
Mate	erial Sour	rce.	Test	Pit No # 2	)					S	oil Descoription.	Silt	with sand					
Test	t Pit No.		TP#	2			Wit	nessed by.		C	ontractor Rep.	Sar	npled by.		Sha	wal Lab by Fie	eld Team,	
Dept	th of (M)	)	2.25	m			QT'	Y. Represented	,	1	Bag Aprox (50 KG)							
		SIE	EVE	ANALY	SIS C	OF GR	RANUL	AR SOILS (A	STM	D 422	)		TEST REPORT LIQUID LIMIT AN	D P	LASTIC LIM	IIT OF SOIL	(ASTM D 4	318)
Α	Wt. of Dr	y Sample	Befor	e Washin	g					g	1648.0	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After	Washing						g	326.6	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss	During	g Washin	g (A - I	B)				g	1321.4	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pa	ssing	75µm (no	. 200)					g	80.2	D	Mass of Dry Soil & Container	g	Me	ரல் வ	A CETTIV	9
Е	Natural M	loisture C	onten	t						%	6.5	Е	Mass of Container	g		ONFPE	ASTU	5
	Sieve	e Size		Weig	gth			% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm	1	Ret CU	M(g)	% fo	retained	Passing	% F	Passing		G	Mass of Dry soil (D - E)	g				
	3	76.2	2	0	(0)		0	100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		0			0	100.0		100			PL	AS	TIC LIMIT	•	•	•
	2	50		0			0.0	100.0		100		Α	Container No		4 D	4 D	Aver	age
	1 1/2	37.5	5	0			0.0	100.0		100		С	Mass of Wet Soil and Container	g				
	1	25		0			0.0	100.0		100		D	Mass of Dry Soil & Container	g				
	3/4	19		0			0.0	100.0		100		Е	Mass of Container	g				
	1/2	12.5	5	0			0.0	100.0		100		F	Mass of Moisture (C - D)	g				
	3/8	9.5		0			0.0	100.0		100		G	Mass of Dry soil (D - E)	g				
	1/4	6.3		56.9	9		3.5	96.5		97		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75		125.			7.6	92.4		92		CL	ASSIFICATION OF SOIL ASTM D 2	487		(ML)	Silt with	n sand
-	# 10	2.00		168.		+	10.2	89.8		90								
$\vdash$	# 40	0.42		205.			12.4	87.6		88			No of Blows / Moisture	Con	tent		nary of LL,	
	# 100	0.15		245.		4	14.9	85.1		85			33.0	+	##	LL @ 25 Blov	VS	NP
#	# 200	0.07		305.			18.6	81.4	_	81	1	8	31.0	#	##	Plastic Limit		NP
	100	F	artic	le Size D	<u>istrid</u>	ution	Curve Jann	ᡐᡳᡘᠻᠯᡕ			y of S,Analysis			$\pm$		Plasticity Inde	I I	NP
	90		╫		╅╫╫	<del>-</del>	<del>                                      </del>	<del>1                                      </del>	Grave		8.0 %	onte	29.0 NONPLAST				DENSITY (AS	STM D1557)
, ve	80 70								Sand		11.0 %	Se	INCH PLAS	414		OMC %		
Sie	60	+++		$\parallel \perp \downarrow \downarrow \downarrow$	11111			1111111	<b>—</b>	) Sieve	81.0 %	stri	25.0	#	##	MDD g/cc		
ing	50	+	+ + + + + + + + + + + + + + + + + + +	$\parallel \parallel \parallel \parallel \parallel \parallel$				<del>                                     </del>		isture	6.5	Moi	23.0	+	##		R (ASTM D1	883)
ass	40	+	11111		<del>                                      </del>	-	╫	<del>                                     </del>	TI		RTICALE SIZE	_	21.0	$\pm$	##	CBR Det. @	95 of MDD	
% Passing Sieve	30 20		Ш		Ш				<u> </u>	DIA	METERS	4	10.0 Number of Blows		100.0	% EXPANSION		
	10	+		$\parallel \parallel \parallel \parallel \parallel \parallel$		+			D 60			7	Number of Blows			CONSOLIDA	TION	
	0	+		Щ	тищ		ш	<u> </u>	D 30									
	C	0.01	C	).1	1		10		D 10							<u>La</u>	<u>b.Manage</u>	<u>r</u>



Cli	ent.		USAI	D				Co	ntractor.	TE	TRA TECH		Jok	No.	G	O -21
Pro	oject.		Geote	chnical Exploration	nn for Salang Tunr	nel Substation, Afg	hanista	n <b>Pro</b>	ject No.	KS	C-229		Saı	mple Date.	11/	10/2013
Pro	oject Locat	tion.	Parva	an Province, Sala	ng Tunnel Subs	tation		Sul	bmitted to.	TE	ra tech		•		•	
Ma	terial Soul	rce.	Test I	Pit No # 2				Soi	il Descoription.	Silt	with Sand					
Te	st Pit No.		TP#	2	Witn	essed by.		Cor	ntractor Rep.	Sar	npled by.		Sha	awal Lab by Fie	eld Team,	
De	pth of ( M	)	1 00.8	m	QTY	. Represented,		1 B	ag Aprox (50 KG)							
		SIE	VE /	ANALYSIS O	F GRANULA	R SOILS (A	STM [	) 422 )			TEST REPORT LIQUID LIMIT AN	D PL	LASTIC LIN	IIT OF SOIL	(ASTM D 4	318)
Α	Wt. of Dr	y Sample	Before	e Washing				g	1725.6	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After '	Washing				g	322.5	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss	During	g Washing (A - E	3)			g	1403.1	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pa	ssing	75µm (no. 200)				g	81.3	D	Mass of Dry Soil & Container	g	_N)@	அலர்பை	A CHEN	<u>a</u>
Е	Natural M	loisture C	ontent	t			•	%	8.5	Е	Mass of Container	g		ON-PE		Ų.
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	Passing	% F	assing	J. ECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		0	0	100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		0	0	100.0		100			PL	.AST	TIC LIMIT			
	2	50		0	0.0	100.0		100		Α	Container No		4 D	4 D	Aver	age
	1 1/2	37.5		0	0.0	100.0		100		С	Mass of Wet Soil and Container	g				
	1	25		0	0.0	100.0		100		D	Mass of Dry Soil & Container	g				
	3/4	19		0	0.0	100.0		100		Е	Mass of Container	g				
	1/2	12.5		0	0.0	100.0		100		F	Mass of Moisture (C - D)	g				
	3/8	9.5		25.8	1.5	98.5		99		G	Mass of Dry soil (D - E)	g				
	1/4	6.3		89.7	5.2	94.8	-	95		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75		156.6	9.1	90.9		91		CL	ASSIFICATION OF SOIL ASTM D 2	2487		(ML)	Silt with	n Sand
-	# 10	2.00		199.8	11.6	88.4		88						. ,		DI DI
-	# 40	0.42		236.7	13.7	86.3	-	86			No of Blows / Moisture	Con	tent		nary of LL,	
	# 100 # 200	0.150		276.9	16.0	84.0 82.6		84 83		-		$\pm$	##	LL @ 25 Blov	WS	NP NP
-	<u> </u>	0.07		299.6	17.4	82.6			of S,Analysis	8	31.0	#	##	Plastic Limit		NP NP
	100		artici	le Size Distridu	Ition Curve	<b>^</b> T <b>^//</b>			<u> </u>	ent	29.0 NON PLAS	#	##	Plasticity Inde	DENSITY (AS	
	90 80 u		ШВ	-0	<del>-</del>		Grave Sand	1	9.0 % 8.0 %	ont	27.0 NON DIACT	FIC		OMC %	DENSIT (A	51W D1557)
	70		ШШ	<del>                                     </del>		<del>                                     </del>		Sieve	83.0 %	rec	25.0					
Ü	60			<del>                                     </del>		<del>                                     </del>	%200 N.Moi		8.5	Stu	25.0	$\pm$		MDD g/cc	R (ASTM D1	003\
1	50		11111	<del>                                     </del>	<del>-                                     </del>	<del>                   </del>	_		RTICALE SIZE	Mo	23.0	#	##		•	003 <i>)</i>
6	70 60 50 40 30 88		Ш				''		METERS		21.0	_		CBR Det. @		
8		+		<del>                                     </del>		<del>                                     </del>	D 60		VILTERS		10.0 Number of Blows		100.0	CONSOLIDA		
	10		++++++++++++++++++++++++++++++++++++	<del>                                     </del>	<del>-                       -  </del>	<del>                                     </del>	D 30							3 2 3 3 2		<u> </u>
	0	_						-+		1				lа	b.Manage	r
	(	0.01	0	.1 1	10		D 10							<u>a</u>	z.iviai iage	<u>.                                    </u>
<u> </u>										<u> </u>						



Cli	ent.		USAI	D				Co	ntractor.	TE	TRA TECH		Jo	b No.	(	O -21
Pro	oject.		Geote	chnical Exploration	nn for Salang Tunr	nel Substation, Afg	hanista	ın <b>Pr</b> e	oject No.	KS	C-229		Sa	mple Date.	11.	/10/2013
Pro	ject Locat	tion.	Parva	n Province, Sala	ing Tunnel Subs	tation		Su	bmitted to.	TE	ra tech		•		•	
Ma	terial Soul	rce.	Test I	Pit No # 3				So	il Descoription.	Silty	/ Sand with gravel					
Tes	st Pit No.		TP#	3	Witn	essed by.		Co	ntractor Rep.	Sar	npled by.		Sh	awal Lab by Fie	eld Team,	
De	pth of ( M )	)	0.75 r	m	QTY	. Represented,		1 E	Bag Aprox (50 KG)							
		SIE	VE /	ANALYSIS O	F GRANULA	R SOILS (AS	STM	D 422			TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LII	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample	Before	e Washing				g	2165.5	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After \	Washing				g	1956.8	В	Number of Bumps					
С	Wt. of Ma	at'Is Loss [	During	g Washing (A - E	3)			g	208.7	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	ssing	75µm (no. 200)				g	9.6	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ontent					%	4.5	Е	Mass of Container	g				
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	Passing	% I	Passing	J SFECIFICATION	G	Mass of Dry soil (D - E)	g	_			
	3	76.2		0	0	100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		0	0	100.0		100			PL	AS1	TIC LIMIT			
	2	50		0	0.0	100.0		100		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5		0	0.0	100.0		100		С	Mass of Wet Soil and Container	g				
	1	25		47	2.2	97.8		98		D	Mass of Dry Soil & Container	g				
	3/4	19		93.6	4.3	95.7		96		Е	Mass of Container	g				
	1/2	12.5		149.8	6.9	93.1		93		F	Mass of Moisture (C - D)	g				
	3/8	9.5		186.3	8.6	91.4		91		G	Mass of Dry soil (D - E)	g				
	1/4	6.3		255.5	11.8	88.2		88		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75		314.5	14.5	85.5		85		CL	ASSIFICATION OF SOIL ASTM D 2	2487		(SM)	Silty Sand	with gravel
	# 10	2.00		696.7	32.2	67.8		68						. ,	,	ŭ
	# 40	0.425		1315.2	60.7	39.3		39			No of Blows / Moisture	Con	tent		nary of LL	
	# 100	0.150		1656.1	76.5	23.5		24				$\pm$	##	LL @ 25 Blov	VS	NP
	# 200	0.075		1794	82.8	17.2	C	17	of C Analysis	(%)	31.0			Plastic Limit		NP
	100	P	artici	e Size Distridu	ition Curve	<b>77</b> 11111			of S,Analysis	BILL	29.0	#	##	Plasticity Inde		NP
	90 80						Grave		15.0 %	onti	29.0 NON PLAS	FIF	#	MOISTURE-	DENSITY (A	STM D1557)
9	ام 70 م		Ш				Sand		68.0 %	De	25.0		#	OMC %		
Ü	60				<del></del>	<del>                                     </del>		Sieve	17.0 %	stri	28.0			MDD g/cc	) (A OTM D	1000)
يّ. ا	50	+++	<del>             </del>		<del>-                                     </del>	<del>                                     </del>		isture	4.5 RTICALE SIZE	Mo	25.0				R (ASTM D	1883)
% Daccing Sieve	40 30		ШШ				"		METERS		21.0	-	<del>世</del>	CBR Det. @		
%	20	+++	ЩЩ		<del>-                                     </del>	<del>                                     </del>	D 60	DIA	WIETERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDA		
	10		119		<del>-                                     </del>		D 60 D 30							CONOCLIDA		
	0	+		<del>                                     </del>		<u> </u>	ט אָט			1				ا ما	b.Manage	\r
	C	0.01	0	.1 1	10		D 10							La	v.iviai iage	<u> </u>
<u> </u>							<u> </u>									



ent.	L	ISAID				Contractor.		TETR	A TECH		Jo	b No.	(	GO -21
ject.	G	eotechnical Exploration	onn for Salang Tun	nel Substation, Afg	hanistan	Project No.		KSC-2	29		Sa	mple Date.	11/	/10/2013
ject Locat	tion. F	arvan Province, Sal	ang Tunnel Subs	tation		Submitted t	0.	TETR	A TECH					
erial Sour	rce. T	est Pit No # 3				Soil Descor	iption.	Silty S	and with gravel					
t Pit No.	Т	P#3	Witr	essed by.		Contractor R	lep.	Samp	ed by.		Sh	awal Lab by Fie	eld Team,	·
th of (M)	) 1	.50 m	QTY	. Represented,		1 Bag Aprox	(50 KG)				-			
	SIE	/E ANALYSIS (	OF GRANULA	AR SOILS (AS	STM D 4	-22 )		-	EST REPORT LIQUID LIMIT AN	ID PI	LASTIC LIN	IIT OF SOIL	(ASTM D	4318)
Wt. of Dr	y Sample B	efore Washing			g	1968	3.6	A C	ontainer No		4 D	2 D	3 D	4 D
Wt. of Dr	y Sample A	fter Washing			g	1722	2.1	B N	ımber of Bumps					
Wt. of Ma	at'ls Loss D	uring Washing (A -	B)		g	246	.5	СМ	ass of Wet Soil and Container	g				
%tage of	Mat'ls Pass	sing 75µm (no. 200)			g	12.	5	D M	ass of Dry Soil & Container	g				
Natural M	loisture Cor	ntent			%	5.1	1	E M	ass of Container	g				
Sieve	e Size	Weigth		% of	Whole	NO.		F M	ass of Moisture (C - D)	g				
ı		- i	% fo retained			SPECII	FICATION			Ť				1
3	76.2	(0)	0	100.0	-				, ,	%				1
2 1/2	63	0	0	100.0	100	)					TIC LIMIT			
2	50	0	0.0	100.0	100	)		A C	ontainer No		4 D	4 D	Ave	rage
1 1/2	37.5	0	0.0	100.0	100			СМ	ass of Wet Soil and Container	g				
1	25	86.6	4.4	95.6	96			D M	ass of Dry Soil & Container	g				
3/4	19	99.6	5.1	94.9	95			E M	ass of Container	g				
1/2	12.5	128.5	6.5	93.5	93			F M	ass of Moisture (C - D)	g				
3/8	9.5	162.8	8.3	91.7	92			G M	ass of Dry soil (D - E)	g				
1/4	6.3	208.9	10.6	89.4	89			Н М	pisture Content (F / G) x 100	%				
# 4	4.75	304.2	15.5	84.5	85			CL AS	SIFICATION OF SOIL ASTM D	2487		(SM)	Silty Sand	with gravel
# 10	2.00	512.1	26.0	74.0	74			OLAC		-407				
# 40	0.425	1254.5	63.7	36.3	36				No of Blows / Moisture	Con	tent			,PL,PI
	0.150	1498.6		23.9				33		+	##		vs	NP
# 200	0.075	1735.6	88.2	11.8				€ 31	0	$\mp$	##			NP
100			ution Curve			nary of S,A				+	##			NP
90				<del>~           </del>				e 27	O BLOSI DI ACT				DENSITY (A	STM D1557
80								20	V NON PLAS	HIL		OMC %		
60					%200 Sie	eve	12.0 %	与 25	0	$\pm$	##	MDD g/cc		
50			<del>-                                    </del>	<del>                                     </del>				S 23	0	$\pm$	##		-	T -
40	<del>                                      </del>		<del>-                                     </del>	<del>                                     </del>						$\pm$	拱			
30						DIAMETER	S		10.0 Number of Blaue		100.0			
10	+			<del></del>	-				Number of Blows			CONSOLIDA	TION	
0	+	<del>!!!!                                  </del>		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	D 30									
C	0.01	0.1 1	10		D 10							<u>La</u>	<u>b.Manage</u>	<u>er</u>
	-	-			1									
	Sieve   Siev	ject.   G ject Location.   P serial Source.   T st Pit No.   T with of (M)   1    Wt. of Dry Sample B   Wt. of Mat'ls Loss Di   %tage of Mat'ls Pass   Natural Moisture Cor   Sieve Size     Inch	Geotechnical Exploration   Parvan Province, Sale   Geotechnical Explorationn for Salang Tunner	Geotechnical Explorationn for Salang Tunnel Substation, Afgiet Location. Parvan Province, Salang Tunnel Substation   Parvan Province, Salang Tunnel Substation   Parvan Province, Salang Tunnel Substation   Parvan Province, Salang Tunnel Substation   Parvan Province, Salang Tunnel Substation   Parvan Province, Salang Tunnel Substation   Passing   Parvan Province, Salang Tunnel Substation   Passing   Parvan Province, Salang Tunnel Substation   Passing   Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan   Ject Location.   Parvan Province, Salang Tunnel Substation   Parvan Province, Sal	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan   Project No.   Parvan Province, Salang Tunnel Substation   Submitted to Soil Descor	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan   Project No.   Submitted to.   Submitted to.   Soil Descoription.   Soil Descoription.   Submitted to.   Soil Descoription.   Soil Descoription.   Soil Descoription.   Submitted to.   Soil Descoription.   Submitted to.   Soil Descoription.   Submitted to.   Soil Descoription.   Submitted to.   Soil Descoription.   Geotechnical Explorationn for Salang Tunnel Substation, Alghanistan   Project No.   KSC-2.   Ject Location.   Parvan Province, Salang Tunnel Substation   Submitted to.   TETRA   Soli Descoription.   Sility St.		Gect.   Geotechnical Exploration for Salang Tunnel Substation	Sect   Septembrical Exploration for Salang Tunnel Substation   Submitted to					



Clie	ent.		USAID				Contractor.	TF	TRA TECH		Jol	No.	(	GO -21
	ject.		Geotechnical Explorati	onn for Salang	Tunnel Substation Afo	ıhanistan	Project No.	+	C-229			mple Date.		10/2013
-	ject Locat		Parvan Province, Sa			mamotan	Submitted to.	+-	TRA TECH		Joan	pio Date.	1 1/	13/2010
	terial Sour		Test Pit No # 3	and identified to	abotation		Soil Descoription.	+	ulder					
-	st Pit No.		TP # 3	lv	Vitnessed by.		Contractor Rep.	+	mpled by.		Sh	awal Lab by Fie	eld Team	
	oth of (M)		2.25 m		QTY. Represented,		Contractor (top.	Joan	inprod ay.		One	arrai Lub by I it	ora rouri,	
20,	oti oi ( iii )	,	VE ANALYSIS			STM D 4	22 )		TEST REPORT LIQUID LIMIT AN	ID PI	LASTIC LIN	IIT OF SOIL	(ASTM D	4318 )
Α	Wt. of Dr		Before Washing	01.01.01.0		g	1	Α	Container No		4 D	2 D	3 D	4 D
В			After Washing			g		В	Number of Bumps					
С	+		During Washing (A -	B)		g		С	Mass of Wet Soil and Container	g				
D			ssing 75µm (no. 200)			g		D	Mass of Dry Soil & Container	q				
Е	Natural M			,		%		Е	Mass of Container	g				
	Sieve	e Size	Weigth		% of	Whole	NO	F	Mass of Moisture (C - D)	q				
	Inch	mm		% fo retain		% Pass	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		70.10.1010	i accing	70. 00	g	Н	Moisture Content (F / G) x 100	%				
	2 1/2	63									TIC LIMIT	· L		-1
	2	50						Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5						С	Mass of Wet Soil and Container	g				
	1	25						D	Mass of Dry Soil & Container	g				
	3/4	19						Е	Mass of Container	g				
	1/2	12.5		6	oulder			F	Mass of Moisture (C - D)	g				
	3/8	9.5						G	Mass of Dry soil (D - E)	g				
	1/4	6.3						Н	Moisture Content (F / G) x 100	%				
	# 4	4.75						CL	ASSIFICATION OF SOIL ASTM D 2	2487		Boulder	Bou	ılder
	# 10	2.00										1 2		DI DI
	# 40	0.425						1	No of Blows / Moisture	Con	tent		nary of LL	
_	# 100	0.150 0.075								$\pm$	##	LL @ 25 Blov	NS	NP NP
	# 200			 		Cumn	nary of S,Analysis		31.0	#	##	Plastic Limit		NP NP
	100	P;	article Size Distric	aution Curve			lary or S,Ariarysis	ent	29.0 NON PLAS	#	##	Plasticity Ind		
	90 80					Gravel		ont	27.0 NON DIACT	FIF		OMC %	DENSITY (A	STW DISSI
8	70					Sand		Se	25.0					
ij	60	+	<del>                                      </del>	<del>-                                      </del>	<del></del>	%200 Sie		stri	25.0	+	##	MDD g/cc		
از	50		<del>                                      </del>		<del>                                     </del>	N.Moistu		Mo	25.0				R (ASTM D	1883)
300	30 do		<del>                                      </del>		<del>                                     </del>		PARTICALE SIZE	1	21.0	$\pm$	<del></del>	CBR Det. @		
% Passing Sieve	20						DIAMETERS	4	10.0 Number of Blown		100.0	% EXPANSI		
"	10					D 60		5	Number of Blows			CONSOLIDA	ATION	
	0					D 30								
	C	0.01	0.1 1	. 1	0	D 10						<u>La</u>	<u>b.Manage</u>	<u>er</u>
		· • =	<b>-</b>		-									



Clie	ent.	I	USAID					Cor	ntractor.	TE	TRA TECH		Jok	No.	(	GO -21
	ject.			nloration	nn for Salang Ti	unnel Substation, Afg	hanistan		ject No.		C-229			mple Date.		10/2013
	ject. ject Locat		Parvan Province				numotan		omitted to.	_	FRA TECH		Joan	pic Date.	1 1/	13/2010
	terial Sour		Test Pit No # 3		ing runnorou				Descoription.	1	ılder					
-	t Pit No.		TP#3	-	Wi	itnessed by.		_	tractor Rep.		npled by.		Sha	awal Lab by Fie	eld Team	
	oth of (M)		3.00 m			TY. Represented,		- 00.	iliacioi riop.				One	awai Lab by i ic	na roam,	
	· · · · · · · · ·	,		SIS O		AR SOILS (AS	STM D	422)			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LIN	IIT OF SOIL	(ASTM D	4318 )
Α	Wt. of Dr		Before Washin			<b>(</b>		g ,		Α	Container No		4 D	2 D	3 D	4 D
В			After Washing	-				g		В	Number of Bumps					
С	·		During Washing		3)			g		С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	ssing 75µm (no	. 200)	,			g		D	Mass of Dry Soil & Container	g				
Е	Natural M			<u> </u>			%			Е	Mass of Container	g				
	Sieve	e Size	Weig	gth		% of	Who	le NO.	00501510451011	F	Mass of Moisture (C - D)	g				
	Inch	mm			% fo retained	d Passing	% Pa	assing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		(0)		Ŭ				Н	Moisture Content (F / G) x 100	%				
	2 1/2	63									PL	AST	IC LIMIT	•	•	•
	2	50								Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5								С	Mass of Wet Soil and Container	g				
	1	25								D	Mass of Dry Soil & Container	g				
	3/4	19								Е	Mass of Container	g				
	1/2	12.5			- Pa	سامامهـــ				F	Mass of Moisture (C - D)	g				
	3/8	9.5			D	<del>ulder -</del>				G	Mass of Dry soil (D - E)	g				
	1/4	6.3								Н	Moisture Content (F / G) x 100	%				
	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Воц	ılder
	# 10	2.00												1 0		DI DI
	# 40	0.425					-				No of Blows / Moisture	Con	tent		nary of LL	
_	# 100 # 200	0.150								-		#		LL @ 25 Blow Plastic Limit	VS	NP NP
			orticle Size D	المناسة ما .	ıtian Cıımıa		Sum	mary	of S,Analysis		31.0	#		Plasticity Inde		NP NP
	100			istriat 	ition Curve		Gravel	IIIIai y	UI 3,Allalysis	ent	29.0 NON PLAST	+	#	MOISTURE-		
١.	90						Sand			ont	27.0 NON PLAST	11		OMC %	DENSIT (A	3 1 W D 1337)
8	70	$\perp$						31		De	25.0					
ij	60	+++			<del>-                                     </del>	<del></del>	%200 \$			Stu	25.0	+		MDD g/cc	) (4 OTM D	1000)
i.	50		<del>                                      </del>		<del>-                                     </del>	<del></del>	N.Mois		TION E OIZE	Moi	25.0				R (ASTM D	1883)
300	40				<del>-                                     </del>		ΙН		TICALE SIZE		21.0	$\pm$	Ш,	CBR Det. @		
% Passing Sieve	20							DIAN	METERS		10.0 Number of Blows		100.0	% EXPANSION		
	10	+				<del>-                                     </del>	D 60			-	Number of Blows			CONSOLIDA	TION	
	0	+		шШ	1 1 1 1 1 1 1 1 1 1 1 1		D 30							<u>.</u> .		
	C	0.01	0.1	1	10		D 10							<u>La</u>	<u>b.Manage</u>	<u>er</u>



Cli	ent.		USAID					Co	ntractor.	TE	FRA TECH		Jo	b No.		GO -21
Pro	ject.		Geotech	nnical Exploration	nn for Salang Tunr	nel Substation, Afgl	nanistan	Pro	ject No.	KS	C-229		Sa	ample Date.	11	/10/2013
Pro	ject Locat	tion.	Parvan	Province, Sala	ang Tunnel Subs	tation		Sul	bmitted to.	TE.	TRA TECH					
Ма	terial Sou	rce.	Test Pi	t No # 4				Soi	I Descoription.	Silt	y Sand with gravel					
Tes	st Pit No.		TP # 4		Witn	essed by.		Cor	ntractor Rep.	Sar	npled by.		SI	nawal Lab by Fie	eld Team,	
De	oth of (M	,	0.75 m			. Represented,			ag Aprox (50 KG)							
		SIE	VE A	NALYSIS O	F GRANULA	R SOILS (AS	TM D	422)			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LI	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample	Before '	Washing				g	3910.0	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After W	ashing				g	3484.0	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss	During \	Washing (A - E	3)			g	426.0	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pa	ssing 7	5µm (no. 200)				g	10.9	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture C	ontent				%		4.2	Е	Mass of Container	g				
	Sieve	e Size		Weigth		% of	Whol	e NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	Passing	% Pa	ssing	or Edit Ida Hon	G	Mass of Dry soil (D - E)	g				
	3	76.2	2	0	0	100.0	10	00		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		0	0	100.0	10	00			PL	AST	IC LIMIT			
	2	50		655	16.8	83.2	8	3		Α	Container No		4 D	4 D	Av	erage
	1 1/2	37.5	5	927	23.7	76.3		6		С	Mass of Wet Soil and Container	g				
	1	25		1097	28.1	71.9	7			D	Mass of Dry Soil & Container	g				
	3/4	19		1143	29.2	70.8	7			Е	Mass of Container	g				
	1/2	12.5		1187	30.4	69.6	7			F	Mass of Moisture (C - D)	g				
	3/8	9.5		1217	31.1	68.9	6			G	Mass of Dry soil (D - E)	g				
-	1/4	6.3		1291	33.0	67.0	6			Н	Moisture Content (F / G) x 100	%				
-	# 4	4.75		1366	34.9	65.1	6			CL	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
-	# 10 # 40	0.42		1924 2652	49.2 67.8	50.8 32.2	5 3				* / a / a / a / a / a / a / a / a / a /			Sumn	l nary of LL	DI DI
	# 40	0.42		2972	76.0	24.0	2				33.0 7 No of Blows / Moisture	Cont	tent	LL @ 25 Blov		NP
-	# 200	0.13		3195	81.7	18.3	1					#	##	Plastic Limit	VS	NP
	<u> </u>			Size Distridu		10.5			of S,Analysis		31.0	$\mp$	##	Plasticity Inde	2V	NP
	100 90					TTTPMT	Gravel	iliai y	35.0 %	ent	29.0 NONPLAS					ASTM D1557)
١,	00						Sand		47.0 %	Cont	27.0 NON PLAS	HC		OMC %	DENOTT (A	101111 101001)
	70	+		<del>-                                     </del>			%200 S	iovo.	18.0 %	lre (	25.0			MDD g/cc		
Ü	60		+++++	<del>-                                     </del>		<del>                                     </del>	N.Moist		4.2	St	25.0	+	##		R (ASTM D	1883)
1.5	50 40								RTICALE SIZE	M		$\mp$		CBR Det. @	•	1
% Dassing Sieve	30	+				<del>                                     </del>	• • • • •		METERS		21.0	-		% EXPANSI		
8			<del>                                      </del>		<del>-                                     </del>	<del>                                     </del>	D 60	<u> </u>			10.0 Number of Blows		100.0	CONSOLIDA		
	10 0		<u> </u>				D 30	+								I
	· ·	0.01	0.1	l 1	10		D 10							La	b.Manag	<u>er</u>
	(	J.U1	0.1	L I	10		טוי ט									
				_												

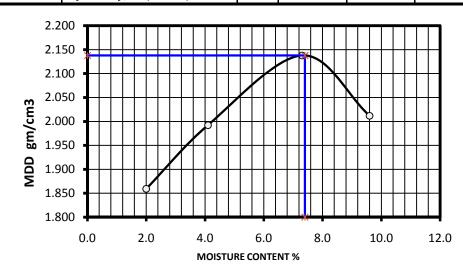


Cli	ent.		USAI	D				Co	ontractor.	TE <sup>-</sup>	TRA TECH		Jo	b No.	(	GO -21
Pro	oject.		Geote	chnical Exploration	nn for Salang Tunr	nel Substation, Afg	hanista	an <b>Pr</b>	oject No.	KS	C-229		Sa	mple Date.	11.	/10/2013
Pro	oject Locat	tion.	Parva	an Province, Sala	ang Tunnel Subs	tation		Sı	ıbmitted to.	TE	TRA TECH		-			
Ma	terial Soul	rce.	Test	Pit No # 4				Sc	il Descoription.	Silty	Sand with gravel					
Te	st Pit No.		TP#	4	Witn	essed by.		Co	ontractor Rep.	Sar	npled by.		Sh	awal Lab by Fie	eld Team,	
De	pth of (M)	)	1.50 ו	m	QTY	. Represented,		1 I	Bag Aprox (50 KG)							
		SIE	VE A	ANALYSIS O	F GRANULA	R SOILS (AS	STM	D 422	)		TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LII	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample	Befor	e Washing				g	3565.9	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After	Washing				g	3356.0	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss	Durino	g Washing (A - E	3)			g	209.9	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pa	ssing	75µm (no. 200)				g	5.9	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture C	ontent	t				%	4.9	Е	Mass of Container	g				
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	Passing	% I	Passing	JONE CIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		0	0	100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		0	0	100.0		100			PL	.AST	IC LIMIT			
	2	50		526	14.8	85.2		85		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5		868	24.3	75.7		76		С	Mass of Wet Soil and Container	g				
	1	25		1125	31.5	68.5		68		D	Mass of Dry Soil & Container	g				
	3/4	19		1198	33.6	66.4		66		Е	Mass of Container	g				
	1/2	12.5		1245	34.9	65.1		65		F	Mass of Moisture (C - D)	g				
	3/8	9.5		1265	35.5	64.5		65		G	Mass of Dry soil (D - E)	g				
	1/4	6.3		1356	38.0	62.0		62		Н	Moisture Content (F / G) x 100	%				
_	# 4	4.75		1422	39.9	60.1		60		CL	ASSIFICATION OF SOIL ASTM D 2	2487		( SM)	Silty Sand	with gravel
	# 10	2.00	_	1845	51.7	48.3		48								DI DI
	# 40	0.42		2756	77.3	22.7		23			No of Blows / Moisture	Con	tent		nary of LL	
-	# 100 # 200	0.150		3024	84.8	15.2 12.6		15 13		4		#	##	LL @ 25 Blov	VS	NP NP
		0.07		3118	87.4	12.6	e		of S,Analysis	(%)	31.0	#		Plastic Limit		NP NP
	100		artic	le Size Distridu	Ition Curve	TTT <b>A</b> IT			1	ent	29.0	#	#	Plasticity Inde		
	90 80						Grave Sand		40.0 % 47.0 %	ont	29.0 NON PLAS	HC		OMC %	DENSIIT (A	3 IWI D1337)
8	70	$\perp$	Ш	<del>                                     </del>	<del>-                                     </del>		_	) Sieve	13.0 %	rec	25.0					
Ü	60	+++	Ш		0000	<del>~      </del>		isture		Stu	25.0	$\pm$		MDD g/cc	R (ASTM D	1002\
1	50		11111		<del>                                      </del>	<del>                 </del>			4.9 RTICALE SIZE	Mo	23.0	#	##		•	1003)
1	70 60 50 40 30 20		Ш				"		METERS		21.0		Ш,	CBR Det. @ % EXPANSION		
8		+++	Щ		<del>-                                     </del>	<del>                                     </del>	D 60		IVILIENS		10.0 Number of Blows		100.0	CONSOLIDA		
	10	+++	++++++++++++++++++++++++++++++++++++	<del>                                     </del>	<del>-                         -  </del>	<del>                                     </del>	D 30		+ +					33302.07		1
	0	+		<del>'  ' ' ' ' ' ' ' '                     </del>	• • • • • • • • • • • • • • • • • • • •		ט טט		+ +	1				اد ا	b.Manage	\r
	(	0.01	0	.1 1	10		D 10							<u>La</u>	J.iviai iage	<u>/1</u>
Ц										<u> </u>						



# Shawal GEMTL Shawal GMTL Shawal GMTL Shawal GMTL Shawal GMTL

	ASTM D-1557 Laboratory Co	ompacti	ion Charac	teristics of	Soil Using	Modified Ef	fort – Pro	ctor
Client.	USAID					Job No.		Scl -5
Project	Geotechnical Explorationn for Sa	lang Tun	nel Substatio	n		Testing Date.		11/15/2013
Contractor	TETRA TECH					Sampled by.		Shawal
Contract No.	KSC-229					Witnessed by.		Contractor Rep.
Location	Test Pit No # 4	De	epth(m)	0.7	5 M			· ·
Line	Proctor		1	2	3	4	5	6
Α	Mass of Mould, Base & Specimen	gm	10400	10777	11246	11057		
В	Mass of Mould & Base plate	gm	6370	6370	6370	6370		
С	Mass of Specimen, (A - B)	gm	4030	4407	4876	4687		
D	Wet Density,W1 =(A-B)/ volume	gm/cm <sup>3</sup>	1.896	2.074	2.294	2.205		
Line	Moisture Content Determination		1	2	3	4	5	6
Е	Container No.	no	C - 9	C - 4	C-7	C - 12		
F	Mass of Wet Soil & Container	g	284.6	566.4	279.5	297.5		
G	Mass of Dry Soil & Container	g	279.8	545.6	264.2	275.6		
Н	Mass of Container	g	40.6	38.6	54.2	47.5		
I	Mass of Moisture, (F - G)	g	4.8	20.8	15.3	21.9		
J	Mass of Dry Soil, (G -H)	g	239.2	507.0	210.0	228.1		
K	Moisture Content, $w = (I/J)x100$	%	2.0	4.1	7.3	9.6		
Line	Dry Density of Soil		1	2	3	4	5	6
L	Dry Density, W= [D/(K+100)]x100	gm/cm <sup>3</sup>	1.859	1.992	2.138	2.012		
М	Dry Density, W= (L*62.43)	PCF	116.1	124.4	133.5	125.6		



ASTM D-1557
18in/457 mm
Manual
4.54 Kg
6370
2125.4
56
7.4
2.138
4.1

Lab Manager QC



### **Shawal Geotechnical Engineering / Materials Testing Laboratory**

#### THE CALIFORNIA BEARING RATIO CBR TEST (ASTM D-1883)

Client.		USAID							Date Sampled : 11/10/2013							
Project.		Geotechni	ical Explo	orationn for	Salang T	Funnel Sub	station		Contractor.	TETRA TECH						
Material	Source.	Test Pit No	o # 4	Depth o	of (M)	0.75	m									
		Densit	y Calcula	ation of M	ould					Graphics:						
Blows		10 Blo	ows	30 BI	ows	65 BI	ows		10 Blows Chart							
Mould No		1		2		3		45.0 40.0								
	Samples (A)	1137		1171		1146		35.0								
			2.0	695		669		30.0								
Sample	(A-B)	450		475		477		B 25.0 - 20.0 -								
	Wet Sample			395		339		20.0 15.0								
	Dry Sample	389		371		319		10.0								
Nt of co		40.		41		42.		5.0								
Wt of wa		25.		24		20.		0.0 0	1 2 3	4 5 6 7 8						
Wt of dry		348 <b>7.</b> 4		329 <b>7</b> .		276			Pe	enetration mm						
Mould Vo	ontent %	210		210		205		60.0	30 Blo	ows Chart						
	sity gm/cm <sup>3</sup>	2.10		2.2		2.3										
	ity gm/cm <sup>3</sup>	1.98		2.0		2.3		50.0								
- , DOI 131	, 9, 0			ord (mm)				40.0								
Date	Duration	10 BI		30 BI	ows	65 BI	ows	30.0 - Pag Kg								
			^	_	^	_	^	20.0								
lr	nitial	0.0	U	0.	U	0.0	U	10.0								
	:	0.0			0.00											
F	Final	0.0	U	0.0	JU	0.0	JU	0	1 2 3	4 5 6 7 8						
Swe	elling %	0.0		0.0	00	0.0	00		Penet	tration mm						
Load/Pe	enetration R	Record		ER AREA m²	19.354 R.F = 4.24			80.0	65 Blo	ow Chart						
Std	Penet.	10 Bi		30 BI	ows	65 BI	ows	70.0								
Load	mm	Readings	Load kg/cm²	Readings	Load kg/cm²	Readings	Load kg/cm <sup>2</sup>	60.0								
	0.00															
		0.0	0.0	0.0	0.0	0.0	0.0	50.0								
	0.64	11.0	2.41	21.2	4.6	28.2	6.2	50 ¥ 40.0								
	0.64 1.27	11.0 29.0	2.41 6.35	21.2 35.8	4.6 7.8	28.2 45.6	6.2 10.0			ò						
70.2	0.64 1.27 1.91	11.0 29.0 50.0	2.41 6.35 10.95	21.2 35.8 73.5	4.6 7.8 16.1	28.2 45.6 85.2	6.2 10.0 18.7	50 ¥ 40.0		ò						
70.3	0.64 1.27 1.91 2.54	11.0 29.0 50.0 73.6	2.41 6.35 10.95 <b>16.1</b>	21.2 35.8 73.5 92.5	4.6 7.8 16.1 <b>20.3</b>	28.2 45.6 85.2 105.2	6.2 10.0 18.7 <b>23.0</b>	Foad Kg								
	0.64 1.27 1.91 2.54 3.81	11.0 29.0 50.0 73.6 98.4	2.41 6.35 10.95 <b>16.1</b> 21.56	21.2 35.8 73.5 92.5 117.2	4.6 7.8 16.1 <b>20.3</b> 25.7	28.2 45.6 85.2 105.2 137.8	6.2 10.0 18.7 <b>23.0</b> 30.2	20.0 10.0								
70.3 105.5	0.64 1.27 1.91 2.54	11.0 29.0 50.0 73.6 98.4 127.3	2.41 6.35 10.95 <b>16.1</b> 21.56 <b>27.9</b>	21.2 35.8 73.5 92.5 117.2 144.7	4.6 7.8 16.1 <b>20.3</b> 25.7 <b>31.7</b>	28.2 45.6 85.2 105.2 137.8 163.2	6.2 10.0 18.7 <b>23.0</b> 30.2 <b>35.8</b>	<b>B</b> 40.0	1 2 3	4 5 6 7 8						
	0.64 1.27 1.91 2.54 3.81 5.08	11.0 29.0 50.0 73.6 98.4 127.3 156.0	2.41 6.35 10.95 <b>16.1</b> 21.56 <b>27.9</b> 34.18	21.2 35.8 73.5 92.5 117.2	4.6 7.8 16.1 <b>20.3</b> 25.7 <b>31.7</b> 40.5	28.2 45.6 85.2 105.2 137.8	6.2 10.0 18.7 <b>23.0</b> 30.2	20.0 10.0		4 5 6 7 8 tration mm						
	0.64 1.27 1.91 2.54 3.81 5.08 7.62	11.0 29.0 50.0 73.6 98.4 127.3 156.0	2.41 6.35 10.95 <b>16.1</b> 21.56 <b>27.9</b> 34.18	21.2 35.8 73.5 92.5 117.2 144.7 184.8	4.6 7.8 16.1 <b>20.3</b> 25.7 <b>31.7</b> 40.5	28.2 45.6 85.2 105.2 137.8 163.2	6.2 10.0 18.7 <b>23.0</b> 30.2 <b>35.8</b> 47.2	20.0 10.0	Pene							
105.5 Tests Res	0.64 1.27 1.91 2.54 3.81 5.08 7.62	11.0 29.0 50.0 73.6 98.4 127.3 156.0	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY O	21.2 35.8 73.5 92.5 117.2 144.7 184.8	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST	28.2 45.6 85.2 105.2 137.8 163.2 215.3	6.2 10.0 18.7 23.0 30.2 35.8 47.2	20.0 10.0	Pene	tration mm						
105.5	0.64 1.27 1.91 2.54 3.81 5.08 7.62 sults	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY O	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR T	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST	28.2 45.6 85.2 105.2 137.8 163.2 215.3	6.2 10.0 18.7 23.0 30.2 35.8 47.2	8 40.0 Per 30.0 10.0 0.0	Pene	tration mm						
105.5 Tests Rec CBR % a	0.64 1.27 1.91 2.54 3.81 5.08 7.62 sults	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN 10-Bit	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY Oows .1	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR TI 30-BI	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST ows	28.2 45.6 85.2 105.2 137.8 163.2 215.3 65-BI	6.2 10.0 18.7 23.0 30.2 35.8 47.2 ows	30.0 20.0 10.0 0	Pene	tration mm						
Tests Res CBR % a CBR % a	0.64 1.27 1.91 2.54 3.81 5.08 7.62 sults at 2.54 <sub>mm</sub> at 5.08 <sub>mm</sub>	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN 10-Ble 16.	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY Oows .1	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR T 30-BI 20	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST ows	28.2 45.6 85.2 105.2 137.8 163.2 215.3 65-BI 23.	6.2 10.0 18.7 23.0 30.2 35.8 47.2 ows	\$\frac{\mathbf{y}}{40.0} \\ \mathbf{q} \\ \mathbf{q} \\ \mathbf{q} \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ <b>0</b> \\ \m	Pene	tration mm						
105.5  Tests Rec CBR % a CBR % a Correct CE Compacti	0.64 1.27 1.91 2.54 3.81 5.08 7.62 sults at 2.54 <sub>mm</sub> at 5.08 <sub>mm</sub> BR%@2.54mm	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN 10-Ble 16.	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY Oows .1	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR T 30-BI 20	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST ows 3	28.2 45.6 85.2 105.2 137.8 163.2 215.3 65-BI 23.	6.2 10.0 18.7 23.0 30.2 35.8 47.2 ows	\$\frac{\mathbf{y}}{40.0} \\ \text{pe}    30.0 \\   \q	Pene	tration mm						
Tests Res CBR % a CBR % a Correct CE Compaction	0.64 1.27 1.91 2.54 3.81 5.08 7.62  sults at 2.54 <sub>mm</sub> at 5.08 <sub>mm</sub> BR%@2.54mm ion Rate %	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN 10-Ble 16.	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY Oows .1	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR TI 30-BI 20 31 28	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST ows 3 .7 .8	28.2 45.6 85.2 105.2 137.8 163.2 215.3 65-BI 23.	6.2 10.0 18.7 23.0 30.2 35.8 47.2 ows	50.0 40.0 50.0 40.0 60.0 40.0 40.0 60.0	Pene	tration mm						
Tests Resconder CBR % a CORROC CCOMPACTION COMPACTION C	0.64 1.27 1.91 2.54 3.81 5.08 7.62 sults at 2.54 <sub>mm</sub> at 5.08 <sub>mm</sub> on Rate % em³) (-)19mm	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN 10-Ble 27.	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY Oows .1	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR T 30-Bl 20 31	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST ows 3 .7 .8	28.2 45.6 85.2 105.2 137.8 163.2 215.3 65-BI 23.	6.2 10.0 18.7 23.0 30.2 35.8 47.2 ows	50.0 45.0 40.0 0 50.0 45.0 40.0 6 30.0 20.0 45.0 40.0 6 8 30.0 45.0 40.0 6 8 8 8 8 8 8 8 8 8 8 8 8 8	Pene	tration mm						
Tests Resconder CBR % a Correct CE Compaction MDD (g/c OMC %	0.64 1.27 1.91 2.54 3.81 5.08 7.62  sults at 2.54 <sub>mm</sub> at 5.08 <sub>mm</sub> BR%@2.54mm ion Rate %	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN 10-Ble 27.	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY Oows .1	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR TI 30-BI 20 31 28	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST ows 3 .7 .8	28.2 45.6 85.2 105.2 137.8 163.2 215.3 65-Bl 23. 35.	6.2 10.0 18.7 23.0 30.2 35.8 47.2 ows	50.0 45.0 40.0 50.0 45.0 40.0 20.0	Pene	tration mm						
Tests RecCBR % a CBR % a Correct CE Compaction MDD (g/cc) CMC % DJUSTEC	0.64 1.27 1.91 2.54 3.81 5.08 7.62 sults at 2.54 <sub>mm</sub> at 5.08 <sub>mm</sub> BR%@2.54mm on Rate % cm³) (-)19mm	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN 10-Bit 27. 22.	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY Oows 1	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR TI 30-BI 20 31 28	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST ows 3 .7 .8	28.2 45.6 85.2 105.2 137.8 163.2 215.3 65-BI 23. 35. 32.	6.2 10.0 18.7 23.0 30.2 35.8 47.2 ows	50.0 45.0 40.0 0 50.0 45.0 40.0 6 30.0 20.0 45.0 40.0 6 8 30.0 45.0 40.0 6 8 8 8 8 8 8 8 8 8 8 8 8 8	CBR & Dry	tration mm						
Tests Rei CBR % a CORRECT CE Compacti MDD (g/c OMC % DJUSTED	0.64 1.27 1.91 2.54 3.81 5.08 7.62 sults at 2.54 <sub>mm</sub> at 5.08 <sub>mm</sub> on Rate % em³) (-)19mm	11.0 29.0 50.0 73.6 98.4 127.3 156.0 SUMN 10-Bit 27. 22.	2.41 6.35 10.95 16.1 21.56 27.9 34.18 MARY O ows 1	21.2 35.8 73.5 92.5 117.2 144.7 184.8 F CBR TI 30-BI 20 31 28	4.6 7.8 16.1 20.3 25.7 31.7 40.5 EST ows 3 .7 .8	28.2 45.6 85.2 105.2 137.8 163.2 215.3 65-Bl 23. 35.	6.2 10.0 18.7 23.0 30.2 35.8 47.2 ows	50.0 45.0 40.0 0 50.0 45.0 40.0 20.0 45.0 40.0 20.0 45.0 40.0 20.0 45.0 40.0 20.0 45.0 40.0 60.	CBR & Dry	density Chart						

Lab Manager QC



									т —			-					
Clie	ent.	ı	USAID			Cor	ntractor.	TET	RA TECH	Jo	b No.	(	GO -21				
Pro	ject.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan						ject No.	KSC-229 Sample Date. 11/10								
Pro	Project Location. Parvan Province, Salang Tunnel Substation						Sub	omitted to.	TET	TETRA TECH							
Material Source. Test Pit No # 4						Soi	l Descoription.	Silty Sand with gravel									
Tes	Test Pit No. TP # 4 Witnessed by.						Cor	ntractor Rep.	Sampled by. Shawal Lab by Field Team,								
Dep	Depth of ( M ) 2.25 m QTY. Represented,							ag Aprox (50 KG)									
		SIE	VE ANALYSIS	OF GRANUL/	AR SOILS (AS	STM D	422)			TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LIN	MIT OF SOIL	(ASTM D	TM D 4318)		
Α	Wt. of Dr	y Sample E	Before Washing				g	2966.0	Α	Container No		4 D	2 D	3 D	4 D		
В	Wt. of Dr	y Sample A	After Washing				g	2711.0	В	Number of Bumps							
С	Wt. of Ma	at'ls Loss D	During Washing (A -	B)			g	255.0	С	Mass of Wet Soil and Container	g						
D	%tage of	Mat'ls Pas	sing 75µm (no. 200)	)			g	8.6	D	Mass of Dry Soil & Container	g						
Е	Natural M	loisture Co	ntent			%	,	5.6	Е	Mass of Container	g						
	Sieve	e Size	Weigth		% of	Whole NO.			F	Mass of Moisture (C - D)	g						
	Inch	mm	Ret CUM(g)	% fo retained	Passing	% Pa	ssing	SPECIFICATION	G	Mass of Dry soil (D - E)	q						
	3	76.2	0	0	100.0	10			, , ,		%		1		1		
	2 1/2	63	0	0	100.0	10	00		PLASTIC LII			IC LIMIT	•				
	2	50	0	0.0	100.0	10	00		Α	A Container No		4 D	4 D	Ave	rage		
	1 1/2	37.5	256	8.6	91.4	9	)1		С	Mass of Wet Soil and Container							
	1	25	446	15.0	85.0	8	5		D	Mass of Dry Soil & Container	g						
	3/4	19	697	23.5	76.5	7	7		Е	Mass of Container							
	1/2	12.5	852	28.7	71.3	71			F	Mass of Moisture (C - D)	g						
	3/8	9.5	1078	36.3	63.7	6	64		G	Mass of Dry soil (D - E)	g						
	1/4	6.3	1101	37.1	62.9		3		Н	Moisture Content (F / G) x 100	%						
	# 4	4.75	1198	40.4	59.6	6	0		CL.	CLASSIFICATION OF SOIL ASTM D 2487			(SM)	Silty Sand with grav			
	# 10	2.00	1768	59.6	40.4		0		01	ACCURICATION OF COLE ACTURE 1	01		, ,				
	# 40	0.425		67.0	33.0		3		7	No of Blows / Moisture	tent	Summary of		1			
_	# 100	0.150		83.1	16.9		7			33.0	##	LL @ 25 Blov	VS	NP			
	# 200	0.075		86.5	13.5		3	(0.4 ) ;	(%)	31.0			Plastic Limit		NP		
	100	Pa	article Size Distric	lution Curve			mary	of S,Analysis			$\pm$		Plasticity Inde		NP		
	90			<del>-                                     </del>	<del>                                      </del>	Gravel		40.0 %	onte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557		
9	80			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	7	Sand		47.0 %	Se	INDIVIDUAL.	н.	##	OMC %				
Sign	60	$\perp$			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	%200 S		13.0 %	stur	25.0	1	##	MDD g/cc				
ing	50				<del>                                     </del>	N.Moist		5.6	Moi	25.0				R (ASTM D	1883)		
% Passing Sieve	40			<del></del>	<del>                                     </del>	TH		PARTICALE SIZE		21.0	1	HH,	CBR Det. @				
%	20						DIAN	METERS		10.0 Number of Blows		100.0	% EXPANSION				
	10	+++			<del>                                     </del>	D 60			5	Number of Blows			CONSOLIDA	TION			
	0	+			<u> </u>	D 30	_		-					. NA -			
	C	0.01	0.1 1	. 10		D 10							<u>La</u>	b.Manage	<u>er</u>		



Cli	ent.		USAID							Contractor. TETRA TECH					No.	G	GO -21	
Pro	<b>Dject.</b> Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan					n <b>Pro</b>	oject No.	KS	C-229	Saı	mple Date.	10/2013						
Pro	Project Location. Parvan Province, Salang Tunnel Substation				Su	Submitted to. TETRA TECH				•		•						
Ма	Material Source. Test Pit No # 4					So	Soil Descoription. Boulder											
Te	Test Pit No. TP # 4 Witnessed by.					Co	ntractor Rep.	Sar	npled by.		Sha	awal Lab by Fie	eld Team,					
De	Depth of ( M ) 3.00 m QTY. Represented,												•	-				
		SIE	VE ANAL	YSIS O	F GRAN	ULAI	R SOILS (AS	тм і	D 422)			TEST REPORT LIQUID LIMIT ANI	D PI	LASTIC LIN	IIT OF SOIL	(ASTM D 4	318)	
Α	Wt. of Dry Sample Before Washing							g		Α	Container No		4 D	2 D	3 D	4 D		
В	Wt. of Dr	y Sample	After Washir	ng					g		В	Number of Bumps						
С	Wt. of Ma	at'ls Loss I	During Wash	ning (A - E	3)				g		С	Mass of Wet Soil and Container	g					
D	%tage of	Mat'ls Pas	ssing 75µm (	(no. 200)					g		D	Mass of Dry Soil & Container	g					
Ε	Natural M	loisture C	ontent						%		Е	Mass of Container	g					
	Sieve	e Size	W	eigth			% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g					
	Inch	mm	Ret 0	CUM(g)	% fo retai	ned	Passing	% F	Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g					
	3	76.2		(0)							Н	Moisture Content (F / G) x 100	%					
	2 1/2	63										PL	AST	TIC LIMIT		•	•	
	2	50									Α	Container No		4 D	4 D	Avei	age	
	1 1/2	37.5									С	Mass of Wet Soil and Container	g					
	1	25									D	Mass of Dry Soil & Container	g					
	3/4	19									Е	Mass of Container	g					
	1/2	12.5			Boi	فلا	ler				F	Mass of Moisture (C - D)	g					
	3/8	9.5									G	Mass of Dry soil (D - E)	g					
	1/4	6.3									Н	Moisture Content (F / G) x 100	%					
	# 4	4.75									CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	lder	
	# 10	2.00															DI DI	
	# 40	0.42									1	33.0 7 No of Blows / Moisture (	Con	tent		nary of LL,		
	# 100 # 200	0.150 0.075											#	##	LL @ 25 Blow Plastic Limit	VS	NP NP	
				District	.t: C			S	mmary	of S,Analysis		31.0	#	##			NP NP	
	100		article Size	District	ution Curv	/e	ПППП			Allalysis	ent	29.0 NON PLAST	#	##	Plasticity Inde			
	90 80							Grave Sand	<del>)</del>		ont	27.0 NON PLAST	11		OMC %	DENSITY (AS	וווספוע ואוופ	
3	70	+++		<del>                                     </del>					Sieve		rec	25.0						
Ü	60	+++	<del>                                      </del>	<del>                                      </del>	<del>-                                     </del>		<del>- - -      </del>	N.Mo			stu	25.0	+	##	MDD g/cc	R (ASTM D1	002\	
	50 6 40		<del>                                      </del>	<del>                                      </del>	<del>-                </del>		<del>               </del>			RTICALE SIZE	Mo	23.0	#	##	CBR Det. @	-	1 003 <i>)</i>	
2	80 70 60 50 40 30 20							٠٠		METERS		21.0	-		% EXPANSION			
8		+++		<del>                                     </del>		-	<del></del>	D 60		WIETEKS		10.0 Number of Blows		100.0	CONSOLIDA			
l	10 0	+++	<del>                                     </del>	<del>                                      </del>	<del>-                </del>		<del>-               </del>	D 30							2 2 2 2		<u> </u>	
l	O	1	· · · · · · · · ·			<del>'</del>		<u> </u>		<del>-   -  </del>	1				اء ا	b.Manage	r	
	C	0.01	0.1	1	:	10		D 10							<u>a</u>	o.iviariage	<u>.</u>	
								<u> </u>			Ь_							



nt.	1.															
iii.	Į.	JSAID				Cor	ntractor.	TET	RA TECH	Jol	o No.	G	GO -21			
ject.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan						ject No.	KSC-229 Sample Date. 11/10								
Project Location. Parvan Province, Salang Tunnel Substation						Suk	omitted to.	TETRA TECH								
Material Source. Test Pit No # 5						Soi	I Descoription.	Silty Sand with gravel								
Test Pit No. TP # 5 Witnessed by.						Cor	ntractor Rep.	Sampled by. Shawal Lab by Field Team,								
Depth of ( M ) 0.75 m QTY. Represented,							ag Aprox (50 KG)									
	SIE	VE ANALYSIS (	OF GRANULA	AR SOILS (AS	STM D	422)			TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LIN	IIT OF SOIL	(ASTM D	M D 4318)		
Wt. of Dr	y Sample E	efore Washing				g	2885.0	Α	Container No		4 D	2 D	3 D	4 D		
Wt. of Dr	y Sample A	fter Washing				g	2420.3	В	Number of Bumps							
Wt. of Ma	at'ls Loss D	uring Washing (A -	B)			g	464.7	С	Mass of Wet Soil and Container	g						
%tage of	Mat'ls Pass	sing 75µm (no. 200)				g	16.1	D	Mass of Dry Soil & Container	g						
Natural M	loisture Co	ntent					3.9	Е	Mass of Container	g						
Sieve	e Size	Weigth		% of W		e NO.	IO.		Mass of Moisture (C - D)	q						
I		- v	% fo retained				SPECIFICATION	G		Ŭ						
3	76.2	(0)	0	100.0				, , , ,		%						
2 1/2	63	0	0	100.0	10	00				TIC LIMIT						
2	50	0	0.0	100.0	10	00		Α	Container No		4 D	4 D	Ave	rage		
1 1/2	37.5	102.3	3.5	96.5	9	6		С	Mass of Wet Soil and Container							
1	25	137.2	4.8	95.2	9	5		D	Mass of Dry Soil & Container	g						
3/4	19	181.6	6.3	93.7	94			Е	Mass of Container							
1/2	12.5	258.9	9.0	91.0	91			F	Mass of Moisture (C - D)	g						
3/8	9.5	360.2	12.5	87.5	8	8		G	Mass of Dry soil (D - E)	g						
1/4	6.3	420.6	14.6	85.4	8	5		Н	Moisture Content (F / G) x 100	%						
# 4	4.75	938.9	32.5	67.5	6	7		CL	I ASSIFICATION OF SOIL ASTM D 2487			(SM)	Silty Sand with grave			
# 10	2.00	1716.5	59.5	40.5	4	1		OL,	ACCII ICATION OF COIL ACTIII D 2	. 701						
# 40	0.425	2215.3	76.8	23.2				9	No of Blows / Moisture	tent						
# 100	0.150	2404.8	83.4	16.6					33.0	##		vs	NP			
# 200	0.075	2412.7	83.6	16.4				(%	31.0		##			NP		
100			ution Curve			mary	T T			+				NP		
90				<del>?~~</del> }				onte	270 810810186				DENSITY (A	STM D1557		
80 70			<u> </u>					90	INUIT PLAS	щ		OMC %				
60			PIII		%200 S	Sieve	16.0 %	stur	25.0	#	##	MDD g/cc				
50			<del>-   /               -  </del>	<del>                                     </del>			3.9	Nois	23.0	$\pm$		CBF	R (ASTM D1	883)		
40		<del></del>	<del>-</del> ^+++++	<del>                                     </del>	TH					$\pm$	拱	CBR Det. @	95 of MDD			
30 20						DIAN	METERS		10.0		100.0					
10				<del>                                     </del>					Number of Blows			CONSOLIDA	TION			
0	+	111111		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	D 30							_				
C	0.01	0.1 1	10		D 10							<u>La</u> l	<u>b.Manage</u>	<u>er</u>		
	Wt. of Dr   Wt. of Dr   Wt. of Dr   Wt. of Dr   Wt. of Mr   %tage of   Natural N   %tage of   Natural N   3   2 1/2   2   1 1/2   1   3/4   1/2   3/8   1/4   # 4   # 10   # 40   # 100   # 200   Natural N   Sieve   1 1/2   1 1/2   3/8   1/4   # 4   # 10   # 40   # 100   80   70   60   50   40   30   20   100    Pict Location.   Fit No.   Tith of (M)   Cith of (M)   C	Parvan Province, Sale	Parvan Province, Salang Tunnel Subsemial Source. Test Pit No # 5   Test Pit No # 5	Parvan Province, Salang Tunnel Substation   Passing	Parvan Province, Salang Tunnel Substation	Parvan Province, Salang Tunnel Substation   Suiterial Source.   Test Pit No # 5   Soit Pit No.   TP # 5   Witnessed by.   Coroth of (M)   0.75 m   QTY. Represented,   1 B   SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)   Wt. of Dry Sample Before Washing   g   Wt. of Dry Sample After Washing   g   Wt. of Dry Sample After Washing   g   Wt. of Mat'ls Loss During Washing (A - B)   g   Wt. of Mat'ls Passing 75µm (no. 200)   g   Natural Moisture Content   %     Sieve Size   Weigth   Weigth   Woof   Whole No.   Inch   mm   Ret CUM(g)   % fo retained   Passing   % Passing   3   76.2   0   0   100.0   100   100   2   1/2   63   0   0   100.0   100   100   2   1/2   63   0   0   0   100.0   100   100   11/2   37.5   102.3   3.5   96.5   96   11/2   37.5   102.3   3.5   96.5   96   3/4   19   181.6   6.3   93.7   94   1/2   12.5   258.9   9.0   91.0   91   3/8   9.5   360.2   12.5   87.5   88   1/4   6.3   420.6   14.6   85.4   85   44   4.75   938.9   32.5   67.5   67   41   40   0.425   2215.3   76.8   23.2   23   #100   0.150   2404.8   83.4   16.6   17   400   10	Per   Province   Parvan Province   Salang Tunnel Substation   Passing   Pa	Parvan Province, Salang Tunnel Substation   Parvan Province, Salang Tunnel Substation   Soil Descoription.   Sity Pit No.   Test Pit No # 5   Witnessed by.   Contractor Rep.   San th of (M)   0.75 m   QTY. Represented,   1 Bag Aprox (50 KG)   SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)   Wt. of Dry Sample Before Washing   g   2885.0   A   Wt. of Dry Sample Before Washing   g   2420.3   B   Wt. of Marl's Loss During Washing (A - B)   g   464.7   C   State of Marl's Passing 75μm (no. 200)   g   16.1   O   State of Marl's Passing 75μm (no. 200)   g   16.1   O   State of Marl's Passing 75μm (no. 200)   G   G   G   G   G   G   G   G   G	Description   Parvan Province, Salang Tunnel Substation   Submitted to.   TETRA TECH	Submitted to.   TETRA TECH	Description   Parvan Province, Salang Tunnel Substation   Submitted to.   TETRA TECH	Submitted to   Subm	Parison Province, Salarg Tunnel Substation   Submitted to,   Soil Descorption.   Siny Sample More   Siny Sample More   Sampled by.   Shawal Lab by Field Team,   The Fig.   Witnessed by.   Contractor Rep.   Sampled by.   Shawal Lab by Field Team,   The Fig.   Witnessed by.   Shawal Lab by Field Team,   The Fig.   Witnessed by.   Shawal Lab by Field Team,   The Fig.   The Fig.   Sampled by.   Shawal Lab by Field Team,   The Fig.   Sampled by.   Shawal Lab by Field Team,   The Fig.   The Fig			



		-							1			-			
Clie	ent.	ι	JSAID				Cor	ntractor.	TET	RA TECH		Jo	b No.	(	GO -21
Pro	ject.	C	Geotechnical Explorati	onn for Salang Tur	nnel Substation, Afg	hanistan	Pro	ject No.	KSC	C-229		Sa	mple Date.	11/	/10/2013
Pro	ject Locat	tion.	Parvan Province, Sa	ang Tunnel Sub	station		Sub	mitted to.	TET	RA TECH					
Mat	erial Sou	rce.	Test Pit No # 5				Soi	Descoription.	Silty	Sand with gravel		·			
Tes	t Pit No.		TP # 5	Wit	nessed by.		Con	tractor Rep.	San	npled by.		Sh	awal Lab by Fie	eld Team,	
Dep	oth of (M)	) 1	1.50 m		Y. Represented,		1 Ba	ag Aprox (50 KG)				•	-		
		SIE	VE ANALYSIS	OF GRANUL	AR SOILS (AS	STM D	422)			TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LIN	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample E	Before Washing		-	9	g	2986.0	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample A	After Washing			9	g	2781.0	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss D	Ouring Washing (A -	B)		9	g	205.0	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 75µm (no. 200)			9	g	6.9	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ntent			%		4.5	Е	Mass of Container	g				
	Sieve	e Size	Weigth	0, 6	% of	Whole	e NO.	00501510451011	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(q)	% fo retained	Passing	% Pa	ssing	SPECIFICATION	G	Mass of Dry soil (D - E)	q				
	3	76.2	0	0	100.0	10			Н	Moisture Content (F / G) x 100	%		1		1
	2 1/2	63	0	0	100.0	10	00				AST	IC LIMIT	•		
	2	50	0	0.0	100.0	10	00		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	65.6	2.2	97.8	9	8		С	Mass of Wet Soil and Container	g				
	1	25	120.7	4.0	96.0	9	6		D	Mass of Dry Soil & Container	g				
	3/4	19	172.8	5.8	94.2	9	4		Е	Mass of Container	g				
	1/2	12.5	245.1	8.2	91.8	9.	2		F	Mass of Moisture (C - D)	g				
	3/8	9.5	322.8	10.8	89.2	8	9		G	Mass of Dry soil (D - E)	g				
	1/4	6.3	399.8	13.4	86.6	8			Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	726.9	24.3	75.7	7	6		CL	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
	# 10	2.00	1897.2	63.5	36.5	3			<u> </u>	AGGII IGATIGN GI GGIL AGTIII DI			, ,		
	# 40	0.425		70.7	29.3	2				No of Blows / Moisture	Con	tent		nary of LL	
_	# 100	0.150		83.4	16.6	1				33.0	+	##	LL @ 25 Blov	VS	NP
	# 200	0.075		87.5	12.5	1:		(0.4 )	8	31.0			Plastic Limit		NP
	100		article Size Distric	lution Curve	क्लभी		mary	of S,Analysis					Plasticity Inde		NP
	90		+++++	<del></del>	<del>Y              </del>	Gravel		24.0 %	onte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557
e e	80					Sand		64.0 %	Sec	INCIN PLAS	HIL	##	OMC %		
Sis	60	+		<del></del>	<del>                                     </del>	%200 S		12.0 %	stri	25.0	#	##	MDD g/cc		
ing	50			<del>-   <b>/</b>            </del>	<del>                                     </del>	N.Moist		4.5	Moi	25.0		##		R (ASTM D	1883)
% Passing Sieve	40			<del>                  </del>	<del>                                     </del>	THE		TICALE SIZE		21.0	1	HH,	CBR Det. @		
%	20						DIAN	METERS		10.0 Number of Blows		100.0	% EXPANSION		
	10	+		<del>-                                     </del>	<del>                                     </del>	D 60			_	Number of Blows			CONSOLIDA	TION	
	0	+				D 30	_		4						
	C	0.01	0.1 1	10		D 10							<u>La</u>	b.Manage	<u>er</u>



Clie	ent.		USAID				Contractor.	TF	TRA TECH		Jol	o No.	(-	GO -21
	ject.			ionn for Salano	Tunnel Substation, Afg	hanistan	Project No.		C-229			mple Date.		10/2013
_	ject Locat		Parvan Province, Sa			namotan	Submitted to.	+ -	TRA TECH		<sub>I</sub> oai	iipio Datoi	1 1/	10,2010
	terial Sour		Test Pit No # 5		2.2.2.4.1011		Soil Descoription.	+	ulder					
	t Pit No.		TP # 5		Witnessed by.		Contractor Rep.		mpled by.		Sha	awal Lab by Fie	eld Team.	
_	oth of ( M )		2.25 m		QTY. Represented,		Community repr				10	arrai =aa 2	,	
	, , , , , , , , , ,				ULAR SOILS (AS	STM D 4	22 )		TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LIN	IIT OF SOIL	(ASTM D	4318 )
Α	Wt. of Dr		Before Washing			g		Α	Container No		4 D	2 D	3 D	4 D
В			After Washing			g		В	Number of Bumps					
С	Wt. of Ma	at'ls Loss [	Ouring Washing (A -	- B)		g		С	Mass of Wet Soil and Container	g				
D	1		ssing 75µm (no. 200			g		D	Mass of Dry Soil & Container	g				
Е	Natural M			,		%		Е	Mass of Container	g				
	Sieve	Size	Weigth		% of	Whole I	NO.	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g)	% fo retai	ned Passing	% Pass	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2						Н	Moisture Content (F / G) x 100	%				
	2 1/2	63									IC LIMIT			
	2	50						Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5						С	Mass of Wet Soil and Container	g				
	1	25						D	Mass of Dry Soil & Container	g				
	3/4	19						Е	Mass of Container	g				
	1/2	12.5			Boulder			F	Mass of Moisture (C - D)	g				
	3/8	9.5						G	Mass of Dry soil (D - E)	g				
	1/4	6.3						Н	Moisture Content (F / G) x 100	%				
	# 4	4.75						СГ	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	ılder
	# 10	2.00												
	# 40	0.425						1	No of Blows / Moisture	Con	tent		nary of LL	
_	# 100	0.150								+	##	LL @ 25 Blov	WS	NP
	# 200	0.075				0	ama af O Amahasia	8	31.0			Plastic Limit		NP
	100	P;	article Size Distri	dution Curv	<u>e</u> 		ary of S,Analysis	E	29.0	$\pm$		Plasticity Inde		NP
	90	+++				Gravel		onte	29.0 NON PLAST			MOISTURE-	DENSITY (A	STM D1557
9	80					Sand		OB	11011110	-		OMC %		
Sie	60	+++		<del>                                     </del>		%200 Sie		stri	25.0	1	##	MDD g/cc		
ğ	50	+	<del>                                     </del>			N.Moistur		loi	25.0	$\pm$			R (ASTM D1	1883)
" Passing Sieve	40	+++					PARTICALE SIZE	_	21.0		拱	CBR Det. @	95 of MDD	
P G	30						DIAMETERS		10.0		100.0	% EXPANSION		
•	10				<del></del>	D 60		5	Number of Blows		100.0	CONSOLIDA	ATION	
	0	+	<u> </u>	<u>                                     </u>	<u>                                     </u>	D 30								
	^	0.01	0.1	1	10	D 10						<u>La</u>	b.Manage	<u>er</u>
	·	,.UI	0.1	<b>-</b>		טו ען								



Cli	ent.		USAID					Co	ntractor.	TE	FRA TECH		Jo	b No.		GO -21
Pro	oject.		Geotech	nical Exploration	nn for Salang Tuni	nel Substation, Afg	ghanista	an <b>Pro</b>	ject No.	KS	C-229		Sa	mple Date.	11/	/10/2013
Pro	oject Locat	tion.	Parvan	Province, Sala	ang Tunnel Subs	tation		Su	bmitted to.	TE:	FRA TECH			-	•	
Ма	terial Sou	rce.	Test Pi	t No # 5				So	il Descoription.	Βοι	ılder					
Te	st Pit No.		TP # 5		Witn	essed by.		Coi	ntractor Rep.	Sar	npled by.		Sh	awal Lab by Fie	eld Team,	
De	pth of ( M	)	3.00 m		QTY	. Represented,										
		SIE	VE A	NALYSIS O	F GRANULA	R SOILS (A	STM	D 422 )			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LII	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample	Before \	Washing				g		Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After W	ashing				g		В	Number of Bumps					
С	Wt. of Ma	at'ls Loss I	During \	Nashing (A - E	3)			g		С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	ssing 75	5μm (no. 200)				g		D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture C	ontent					%		Е	Mass of Container	g				
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	Passing	% I	assing	S. ESII IOATION	G	Mass of Dry soil (D - E)	g				
	3	76.2								Н	Moisture Content (F / G) x 100	%				
	2 1/2	63									PL	.AST	IC LIMIT			
	2	50								Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5								С	Mass of Wet Soil and Container	g				
	1	25								D	Mass of Dry Soil & Container	g				
	3/4	19			<u> </u>	1-1				Е	Mass of Container	g				
	1/2	12.5			ROU	lder				F	Mass of Moisture (C - D)	g				
	3/8	9.5								G	Mass of Dry soil (D - E)	g				
-	1/4	6.3								Н	Moisture Content (F / G) x 100	%				
-	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Воц	ılder
	# 10 # 40	2.00 0.42										2500	3.7.0%	Sumn	l nary of LL	DI DI
	# 100	0.42									33.0 7 No of Blows / Moisture	Con	tent	LL @ 25 Blov		NP
	# 200	0.075								-	310	$\pm$		Plastic Limit	WO	NP
				Size Distridu	ution Curve		Su	mmarv	of S,Analysis		31.0	$\pm$		Plasticity Inde	ex	NP
	100 90						Grave			tent	29.0 NON PLAS	$\pm$	##	MOISTURE-		
١,	00					<del>                                     </del>	Sand			Con	27.0 NON PLAS	HE		OMC %		,
3	70	+++		<del>-                                     </del>	<del>-                                     </del>	<del>                                     </del>	-	) Sieve		2	25.0	-		MDD g/cc		
5	<b>6</b> 0			<del>-                                      </del>	<del>-                                     </del>	<del>                                     </del>		isture		oist	25.0	$\pm$			R (ASTM D	1883)
3	50 40								RTICALE SIZE	ž				CBR Det. @	•	1
6	30			<del>-                                     </del>	<del>-                                     </del>	<del>                                     </del>			WETERS		21.0			% EXPANSION		
8				<del>-                                      </del>	<del>-                                     </del>	<del>                     </del>	D 60			_	10.0 Number of Blows		100.0	CONSOLIDA		
	10 0						D 30							1		<u>'</u>
	· ·	0.01	0.1	4	10		1			1				La	b.Manage	er
1	(	0.01	0.1	. 1	10		D 10									_
							-			•						



Clic															
Cile	nt.	L	JSAID				Cor	ntractor.	TET	RA TECH		Jol	o No.	G	GO -21
Proj	ect.	G	eotechnical Explorati	onn for Salang Tun	nel Substation, Afg	hanistan	Pro	ject No.	KSC	C-229		Sa	mple Date.	11/	10/2013
Pro	ect Locat	ion. F	arvan Province, Sa	lang Tunnel Subs	station		Sub	mitted to.	TET	RA TECH					
Mat	erial Sour	rce. T	est Pit No # 6				Soil	Descoription.	Silty	Sand with gravel					
Tes	t Pit No.	Т	P#6	Witr	nessed by.		Con	tractor Rep.	San	npled by.		Sh	awal Lab by Fie	eld Team,	
Dep	th of (M)	) 0	.75 m	QTY	. Represented,		1 Ba	ag Aprox (50 KG)							
		SIE	/E ANALYSIS (	OF GRANULA	AR SOILS (AS	STM D	422)			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LIN	IIT OF SOIL	(ASTM D	1318)
Α	Wt. of Dr	y Sample B	efore Washing			Ç	g	2261.0	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample A	fter Washing			Ç	g	2091.4	В	Number of Bumps					
С	Wt. of Ma	at'Is Loss D	uring Washing (A -	B)		Ç	g	169.6	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pass	sing 75µm (no. 200)	)		9	g	7.5	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ntent			%		3.7	Е	Mass of Container	g				
	Sieve	e Size	Weigth		% of	Whole	e NO.	CDECIFICATION:	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g)	% fo retained	Passing	% Pa	ssing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2	0	0	100.0	10			Н	Moisture Content (F / G) x 100	%				
	2 1/2	63	0	0	100.0	10	00				AST	IC LIMIT	•		•
	2	50	0	0.0	100.0	10	00		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	0	0.0	100.0	10	00		С	Mass of Wet Soil and Container	g				
	1	25	0	0.0	100.0	10	00		D	Mass of Dry Soil & Container	g				
	3/4	19	19.3	0.9	99.1	9	9		Е	Mass of Container	g				
	1/2	12.5	37.2	1.6	98.4	9	8		F	Mass of Moisture (C - D)	g				
	3/8	9.5	55.5	2.5	97.5	9			G	Mass of Dry soil (D - E)	g				
$\perp$	1/4	6.3	93.7	4.1	95.9	9	6		Н	Moisture Content (F / G) x 100	%				
<u></u>	# 4	4.75	361.3	16.0	84.0	8			CL	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
_	# 10	2.00	842.6	37.3	62.7	6									
	# 40	0.425	1706.2	75.5	24.5	2			1	No of Blows / Moisture	Con	tent		nary of LL	•
_	# 100	0.150	1885.4	83.4	16.6	1					1	##	LL @ 25 Blov	VS	NP
-	# 200	0.075	1978.2	87.5	12.5	1:		of C Ameliania	(%)	31.0	F		Plastic Limit		NP
	100		rticle Size Distric	lution Curve	<b>471</b> 1997		mary	of S,Analysis					Plasticity Inde		NP
	90		<del>                                     </del>		<del>                                     </del>	Gravel		16.0 %	onte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557)
),	80 70					Sand		71.0 %	Se	25.0	-	#	OMC %		
Sie	60	++++		<del>                                      </del>	<del>                                     </del>	%200 S		13.0 %	stur	25.0	1		MDD g/cc	. /	1000)
ing	50		<del>                                      </del>	<del>/                                    </del>	<del>                                     </del>	N.Moist		3.7	Moi	25.0				R (ASTM D1	883)
% Passing Sieve	40 30				<del>                                     </del>	1111		TICALE SIZE		21.0		HE,	CBR Det. @		1
%	20					D 00	DIAN	METERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDATE		
	10	+++	00	<del>-                                     </del>	<del>                                     </del>	D 60	_			Humber of Blows			CONSOLIDA	TION	
	0	+ + + + + + + + + + + + + + + + + + + +			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	D 30							اء ا	h Mana-:-	
	C	0.01	0.1 1	. 10		D 10							<u>La</u>	b.Manage	<u>er</u>



										-						
Clie	ent.		USAID					Co	ntractor.	TE	RA TECH		Jo	b No.	(	GO -21
Pro	ject.		Geotechnical Explor	ationn for Sala	ng Tunn	nel Substation, Afg	hanista	n <b>Pro</b>	oject No.	KS	C-229		Sa	mple Date.	11	/10/2013
Pro	ject Locat	tion.	Parvan Province, S	Salang Tunne	Subst	tation		Su	bmitted to.	TE	RA TECH					
Mat	terial Soul	rce.	Test Pit No # 6					So	il Descoription.	Silty	Sand with gravel					
Tes	t Pit No.		TP # 6		Witne	essed by.		Со	ntractor Rep.	San	npled by.		Sh	awal Lab by Fie	eld Team,	
Dep	oth of (M)	)	1.50 m		QTY.	. Represented,		1 E	Bag Aprox (50 KG)							
		SIE	VE ANALYSIS	OF GRAI	NULA	R SOILS (AS	MT	D 422 )			TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LI	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample I	Before Washing					g	2546.5	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample /	After Washing					g	2341.1	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss D	During Washing (A	л - В)				g	205.4	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 75µm (no. 20	00)				g	8.1	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ntent					%	4.5	Е	Mass of Container	g				
	Sieve	e Size	Weigth			% of	Wh	ole NO.	CDECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g	) % fo reta	ained	Passing	% F	Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2	0	0		100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63	0	0		100.0		100					TIC LIMIT	•		
	2	50	0	0.0		100.0		100		Α	Container No		4 D	4 D	Ave	erage
	1 1/2	37.5	0	0.0		100.0		100		С	Mass of Wet Soil and Container	g				
	1	25	0	0.0		100.0		100		D	Mass of Dry Soil & Container	g				
	3/4	19	56.2	2.2		97.8		98		Е	Mass of Container	g				
	1/2	12.5	99.8	3.9		96.1		96		F	Mass of Moisture (C - D)	g				
	3/8	9.5	125.6	4.9		95.1		95		G	Mass of Dry soil (D - E)	g				
	1/4	6.3	189.7	7.4		92.6		93		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	396.6	15.6		84.4		84		CL	ASSIFICATION OF SOIL ASTM D 2	2487		(SM)	Siltv Sand	with gravel
	# 10	2.00	756.6	29.7		70.3		70						, ,		
<u> </u>	# 40	0.425		71.2		28.8		29			No of Blows / Moisture	Con	tent		nary of LL	
_	# 100	0.150		80.7		19.3		19		-			##	LL @ 25 Blov	vs	NP
-	# 200	0.075		87.0		13.0		13	af C Amalastic	(%)	31.0			Plastic Limit		NP
	100	Pi	article Size Dist	ridution Cui	ve IIO 9	<b>7</b> 71			of S,Analysis					Plasticity Inde		NP
	90	+++	<del>                                     </del>			<del>                                     </del>	Grave		16.0 %	onte	29.0 NON PLAS	H		MOISTURE-	DENSITY (A	STM D1557
N. S.	80						Sand		71.0 %	Se	25.0	-		OMC %		
Sie	60	+++		$\parallel / \overline{1} + \parallel \parallel$	$\coprod$	<del>                                     </del>		Sieve	13.0 %	stur	25.0	1		MDD g/cc	. / . 0====	4000)
ing	50	+++		<del>                                     </del>	HH-H	<del>                                     </del>	N.Mo		4.5	Mo	25.0	I			R (ASTM D	1883)
% Passing Sieve	40						"		RTICALE SIZE		21.0		<del>世</del>	CBR Det. @		
%	20						D 2.1	DIA	METERS	-	10.0 Number of Blows		100.0	% EXPANSION CONSOLIDATE		
	10	+++					D 60			_	Humber of Blows			CONSOLIDA	TION	
	0	+++	<del>'''''                                  </del>	ЩТТПП	Щ	<u> </u>	D 30			ļ				اء ا	h Manser	
	C	0.01	0.1	1	10		D 10							<u>La</u>	b.Manage	<u> </u>
							<u> </u>			<u> </u>						



		-								1			1			
Clie	ent.	ļ	JSAID					Co	entractor.	TET	RA TECH		Jo	b No.	(	GO -21
Pro	ject.		Geotechnical E	xploratio	onn for Salang	Tunnel Substation, A	fghanist	an <b>Pro</b>	oject No.	KSO	C-229		Sa	mple Date.	11	/10/2013
Pro	ject Locat	tion.	Parvan Provir	nce, Sala	ang Tunnel S	Substation		Su	bmitted to.	TET	RA TECH					
Mat	erial Sou	rce.	Test Pit No#	6				So	il Descoription.	Silty	Sand with gravel					
Tes	t Pit No.		TP#6		V	Witnessed by.		Со	ntractor Rep.	San	npled by.		Sh	awal Lab by Fie	eld Team,	
Dep	oth of (M)	)	2.25 m		G	QTY. Represented	,	1 E	Bag Aprox (50 KG)							
		SIE	VE ANALY	/SIS C	F GRANU	JLAR SOILS (A	STM	D 422 )	)		TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LI	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample I	Before Washi	ng				g	2455.2	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample /	After Washing	9				g	2288.4	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss D	Ouring Washi	ng (A - E	3)			g	166.8	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 75µm (n	o. 200)				g	6.8	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ntent					%	5.1	Е	Mass of Container	g				
	Sieve	e Size	We	igth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret C	UM(g)	% fo retain	ed Passing	%	Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2	(	(0)	0	100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		)	0	100.0		100				AS	TIC LIMIT	•		•
	2	50	(	)	0.0	100.0		100		Α	Container No		4 D	4 D	Ave	erage
	1 1/2	37.5	(	)	0.0	100.0		100		С	Mass of Wet Soil and Container	g				
	1	25	85	5.7	3.5	96.5		97		D	Mass of Dry Soil & Container	g				
	3/4	19	124	4.6	5.1	94.9		95		Е	Mass of Container	g				
	1/2	12.5	199	9.8	8.1	91.9		92		F	Mass of Moisture (C - D)	g				
	3/8	9.5	24	5.6	10.0	90.0		90		G	Mass of Dry soil (D - E)	g				
	1/4	6.3	298	8.6	12.2	87.8		88		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	38		15.8	84.2		84		CI	ASSIFICATION OF SOIL ASTM D 2	2487		(SM)	Silty Sand	with gravel
	# 10	2.00	689		28.1	71.9	_	72								
	# 40	0.425		9.5	81.4	18.6	$\bot$	19			No of Blows / Moisture	Con	tent		nary of LL	
-	# 100	0.150		5.6	83.3	16.7	_	17			33.0	1	##	LL @ 25 Blov	vs	NP
-	# 200	0.075		2.2	86.0	14.0	_	14		(%)	31.0			Plastic Limit		NP
	100	Pa	article Size   	Distrid 	ution Curve				of S,Analysis					Plasticity Inde		NP
	90	+++	<del>         </del>	+++++		<del>~~~</del>	Grav		16.0 %	onte	29.0 NON PLAS	FI/		MOISTURE-	DENSITY (A	STM D1557
, ve	80 70						Sand		70.0 %	Sec	25.0	-		OMC %		
Sie	60		<del>           </del>	<del>                                     </del>	/	<del>                                     </del>		) Sieve	14.0 %	stur	25.0	#	##	MDD g/cc		4000
ing	50	+++		<del>                                     </del>		<del>                                     </del>		isture	5.1	Moi	25.0				R (ASTM D	1
% Passing Sieve	40 30						T		RTICALE SIZE		21.0	$\pm$	##	CBR Det. @		)
%	20						D 0	DIA	METERS	-	10.0 Number of Blows		100.0	% EXPANSION CONSOLIDA		
	10			<del>                                      </del>			D 60			_	Humber of Blows			CONSOLIDA	TION	
	0	+	111111 1 1	ттт		<del>                                     </del>	D 30			4				l a	h Manser:	
	C	0.01	0.1	1	1	0	D 10							<u>La</u>	b.Manage	<u>}r</u>



Clie	nt.	L	ISAID				Con	tractor.	TET	RA TECH		Jo	b No.	(	GO -21
Proj	ject.	G	eotechnical Exploration	onn for Salang Tun	nel Substation, Afg	hanistan	Proj	ect No.	KSC	-229		Sa	mple Date.	11/	10/2013
Pro	ject Locat	tion. P	arvan Province, Sal	ang Tunnel Subs	tation		Sub	mitted to.	TET	RA TECH					
Mat	erial Sour	rce. T	est Pit No # 6				Soil	Descoription.	Silty	Sand with gravel					
Tes	t Pit No.	Т	P#6	Witr	essed by.		Cont	ractor Rep.	Sam	pled by.		Sh	awal Lab by Fie	eld Team,	
Dep	th of (M)	) 3	.00 m	QTY	. Represented,		1 Ba	g Aprox (50 KG)							
		SIE	/E ANALYSIS (	F GRANULA	AR SOILS (AS	STM D 4	122)			TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LIN	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample B	efore Washing			g		2966.3	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample A	fter Washing			g		2715.8	В	Number of Bumps					
С	Wt. of Ma	at'Is Loss D	uring Washing (A -	B)		g		250.5	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pass	sing 75µm (no. 200)			g		8.4	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Cor	ntent			%		5.9	Е	Mass of Container	g				
	Sieve	e Size	Weigth		% of	Whole	NO.	CDECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g)	% fo retained	Passing	% Pas	sing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2	0	0	100.0	100			Н	Moisture Content (F / G) x 100	%				
	2 1/2	63	0	0	100.0	100	)				AST	IC LIMIT	•		
	2	50	0	0.0	100.0	100	)		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	0	0.0	100.0	100	)		С	Mass of Wet Soil and Container	g				_
	1	25	199.8	6.7	93.3	93	;		D	Mass of Dry Soil & Container	g				
	3/4	19	357.6	12.1	87.9	88	1		Е	Mass of Container	g				
	1/2	12.5	589.7	19.9	80.1	80	)		F	Mass of Moisture (C - D)	g				
	3/8	9.5	825.6	27.8	72.2	72			G	Mass of Dry soil (D - E)	g				
	1/4	6.3	989.7	33.4	66.6	67			Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	1089.7	36.7	63.3	63			CL A	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
_	# 10	2.00	1998.4	67.4	32.6	33			0_,		01		, ,		
_	# 40	0.425	2158.9	72.8	27.2	27				No of Blows / Moisture	Con	tent		nary of LL	
-	# 100	0.150	2364.8	79.7	20.3	20				33.0	+	##	LL @ 25 Blov	VS	NP
-	# 200	0.075	2545.3	85.8	14.2	14		(0.4	(%)	31.0			Plastic Limit		NP
	100		rticle Size Distrid	ution Curve			nary	of S,Analysis			$\pm$		Plasticity Inde		NP
	90		<del>                                      </del>	<del>-                                     </del>	<del>}^             </del>	Gravel		37.0 %	onte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557
Š	80 70					Sand		49.0 %	Sec	NOIN PLAS	н.	##	OMC %		
Sie	60	+	<del>                                     </del>		<del>                                     </del>	%200 Si		14.0 %	stur	25.0	+	##	MDD g/cc		
ing	50			<del>-                                     </del>	<del>                                     </del>	N.Moistu		5.9	MO	25.0				R (ASTM D	1
% Passing Sieve	40 30		<del>                                      </del>	<del>_</del> ////////	<del>                                     </del>			TICALE SIZE		21.0	1	HH,	CBR Det. @		
%	20		O P				DIAM	ETERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDATE		
	10	<del>                                     </del>			<del>                                     </del>	D 60				Number of Blows			CONSOLIDA	TION	
1	0	+ + + + + + + + + + + + + + + + + + + +	<del>                                      </del>		<u> </u>	D 30								- M	
1	C	0.01	0.1 1	10		D 10							<u>La</u>	b.Manage	<u>er</u>
1							1		I						

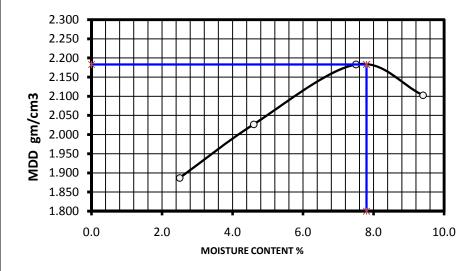


Clie	nt.	ι	JSAID				Con	tractor.	TET	RA TECH		Jol	o No.	(	GO -21
Pro	ject.	C	eotechnical Explorati	onn for Salang Tun	nel Substation, Afg	hanistan	Proj	ject No.	KSC	-229		Sa	mple Date.	11,	10/2013
Pro	ject Locat	tion. F	arvan Province, Sa	ang Tunnel Subs	tation		Sub	mitted to.	TET	RA TECH					
Mat	erial Sour	rce.	est Pit No # 7				Soil	Descoription.	Silty	Sand with gravel					
Tes	t Pit No.	Т	P#7	Witr	essed by.		Con	tractor Rep.	San	pled by.		Sh	awal Lab by Fie	eld Team,	
Dep	th of (M)	) (	.75 m	QTY	. Represented,		1 Ba	ag Aprox (50 KG)							
		SIE	/E ANALYSIS (	OF GRANULA	AR SOILS (AS	STM D 4	422)			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LIN	IIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample E	efore Washing			g	ı	2343.0	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample A	fter Washing			g		2050.0	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss D	uring Washing (A -	B)		g		293.0	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pass	sing 75µm (no. 200)			g		12.5	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ntent			%		3.9	Е	Mass of Container	g				
	Sieve	e Size	Weigth		% of	Whole	NO.	00501510451011	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g)	% fo retained	Passing	% Pas		SPECIFICATION	G	Mass of Dry soil (D - E)	q				
	3	76.2	0	0	100.0	100			H	Moisture Content (F / G) x 100	%				
	2 1/2	63	0	0	100.0	100	0					IC LIMIT			1
	2	50	0	0.0	100.0	100	0		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	116	5.0	95.0	95	5		С	Mass of Wet Soil and Container	g				
	1	25	280	12.0	88.0	88	3		D	Mass of Dry Soil & Container	g				
	3/4	19	308	13.1	86.9	87	,		Е	Mass of Container	g				
	1/2	12.5	376	16.0	84.0	84	ļ		F	Mass of Moisture (C - D)	g				
	3/8	9.5	426	18.2	81.8	82	2		G	Mass of Dry soil (D - E)	g				
	1/4	6.3	571	24.4	75.6	76	6		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	965	41.2	58.8	59	)		CL	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
	# 10	2.00	1670	71.3	28.7	29	)		OL,		01				
	# 40	0.425	1921	82.0	18.0	18				No of Blows / Moisture	Con	tent		nary of LL	,PL,PI
_	# 100	0.150	1994	85.1	14.9	15				33.0	+	##	LL @ 25 Blov	vs	NP
	# 200	0.075	2025	86.4	13.6	14		<u> </u>	8	31.0	+	##	Plastic Limit		NP
	100		rticle Size Distric	lution Curve			mary	of S,Analysis			=		Plasticity Inde		NP
	90		<del>                                      </del>			Gravel		41.0 %	onte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557
Š	80 70					Sand		45.0 %	000	INCIN PLAS	446		OMC %		
Sie	60					%200 Si	eve	14.0 %	stur	25.0	#	##	MDD g/cc		
in	50				<del>                                     </del>	N.Moistu		3.9	Mois	25.0	+			R (ASTM D	1883)
ass	40	<del>                                      </del>	<del>                                      </del>	<del>-   /               -   -   -   -   -   </del>	<del>                                     </del>			TICALE SIZE		21.0	$\pm$	<del>                                      </del>	CBR Det. @	95 of MDD	
% Passing Sieve	30 20					<del></del>	DIAN	IETERS		10.0		100.0	% EXPANSION		
"`	10	+			<del>                                     </del>	D 60			_	Number of Blows			CONSOLIDA	TION	
	0	+	111111			D 30							_		
	C	0.01	0.1 1	10		D 10							<u>La</u>	b.Manage	<u>er</u>
		-	-			"			I						



### Shawal GEMTL Shawal GMTL Shawal GMTL Shawal GMTL Shawal GMTL

ASTI	M D-1557 Laboratory Com	pactio	n Charac	teristics o	f Soil Usi	ng Modified	Effort – P	roctor
Client.	USAID					Job No.		Scl -7
Project	Geotechnical Explorationn for Sa	ang Tun	nel Substatio	n		Testing Date.		15/10/2013
Contractor	TETRA TECH					Sampled by.		Shawal
Contract No.	KSC-229					Witnessed by.		Contractor Rep.
Location	Test Pit No #7	De	epth(m)	0.7	5 M			
Line	Proctor		1	2	3	4		
А	Mass of Mould, Base & Specimen	gm	10493	10888	11368	11271		
В	#REF!	gm	6387	6387	6387	6387		
С	#REF!	gm	4106	4501	4981	4884		
D	Wet Density,WI =(A-B)/ volume	gm/cm <sup>3</sup>	1.934	2.120	2.347	2.301		
Line	Moisture Content Determination		1	2	3	4		
E	Container No.	no	C - 9	C - 4	C - 7	C - 12		
F	Mass of Wet Soil & Container	g	278.6	255.8	297.5	228.5		
G	Mass of Dry Soil & Container	g	272.8	246.2	280.5	212.9		
Н	Mass of Container	g	40.6	38.6	54.2	47.5		
I	Mass of Moisture, (F - G)	g	5.8	9.6	17.0	15.6		
J	Mass of Dry Soil, (G -H)	g	232.2	207.6	226.3	165.4		
K	Moisture Content, $w = (I/J)x100$	%	2.5	4.6	7.5	9.4		
Line	Dry Density of Soil		1	2	3	4		6
L	Dry Density, W= [D/(K+100)]x100	gm/cm <sup>3</sup>	1.887	2.027	2.183	2.103		
М	Dry Density, <i>W</i> = ( <i>L</i> *62.43)	PCF	117.8	126.5	136.3	131.3		



TEST METHOD	ASTM D-1557
DROP HEIGHT	18in/457 mm
COMPACTION TYPE	Manual
RAMMER WEIGHT	4.54 Kg
MOULD WEIGHT gm	6387
MOULD VOLUME gm/cm <sup>3</sup>	2122.7
BLOWS/LAYER	56
(OMC)%	7.8
(MDD) gm/cm <sup>3</sup>	2.183
(NMC)%	4.3

Lab Manager QC



### **Shawal GEMTL**

### Shawal Geotechnical Engineering / Materials Testing Laboratory

### THE CALIFORNIA BEARING RATIO CBR TEST (ASTM D-1883)

									•		•
Client.		USAID							Da	te Sampled :	11/10/2013
Project.		Geotechni Substatior		orationn for	Salang 1	Γunnel			Со	ntractor.	TETRA TECH
Material Sour	rce.	Test Pit N	o#7	Depth o	of (M)	0.75	m				
		Densit	y Calcul	ation of Me	ould			<u> </u>	ļ.	Gi	raphics:
Blows	į	10 BI	ows	30 BI	ows	65 BI	ows			10 Blov	vs Chart
Mould No.		1		2		3		45.0			
Mould+Sample	les (A)	1148	35.5	1183	32.8	1158	1.7	40.0 - 35.0 -			
Mould	(B)	687	2.0	695	7.0	669	0.0	30.0 -			
	(A-B)	461		487		489		Load Kg 25.0 -			
Cont. + Wet S		402		294		345		15.0 -			0
Cont. + Dry Sa		376		276		323		10.0 -			
Wt of containe	er !	40		41		42.		5.0 - 0.0 6			
Wt of water		26		18		21.		0.0 0	) 1	2 3	4 5 6 7 8
Wt of dry soil Water Content	+ 0/	335 <b>7.</b>		23 <sup>4</sup>		281 <b>7.</b> 8				Pen	etration mm
Mould Volume		210		210		205		60.0		30 Blov	vs Chart
Wet Density gm		2.1		2.2		2.3		1			
Dry Density gm/		2.0		2.1		2.2		50.0			
zry zonowy gm,	,			ord (mm)		<u>,</u>	• •	40.0			
Date Dura	ration ,	10 BI		30 BI	ows	65 BI	ows	30.0 Kg Kg 20.0			-
	- 1							20.0 گ		-	0
Initial	i	0.	0	0.	0	0.0	D	10.0			
F:I	j	0	0					0.0			
Final		0.	U	0.0	10	0.0	10		0 1	2 3	4 5 6 7 8
Swelling 9	%	0.0		0.0	00	0.0	0			Penetra	ation mm
Load/Penetra	ation R	ecord		ER AREA m²	19.354	R.F =	4.24	80.0		65 Blow	Chart
Std Pe	enet.	10 BI		30 BI	ows	65 BI	ows	70.0			
Load m	nm	Readings	Load kg/cm²	Readings	Load kg/cm²	Readings	Load kg/cm²	60.0			
0.	.00	0.0	0.0	0.0	0.0	0.0	0.0	50.0			
	.64	15.3	3.35	22.2	4.9	25.2	5.5	<b>b</b> 40.0 <b>g</b> 30.0			
	.27	30.4	6.66	39.5	8.7	51.7	11.3	30.0			<del>-</del>
	.91	44.1	9.66	60.3	13.2	73.6	16.1	20.0			
	.54	58.3	12.8	81.2	17.8	103.6	22.7	10.0			
	3.81 j	75.9	16.63	92.8	20.3	138.6	30.4	0.0			
	.08 '.62	84.2	18.4	108.2	23.7	165.3	<b>36.2</b> 44.1	1	0 1	2 3	4 5 6 7 8
/-	.02 /	114.3	25.04	131.5 F CBR T	28.8 <b>FST</b>	201.4	44.1			Penetr	ation mm
Tests Results		10-BI		30-BI		65-BI	ows			CBD & Dry o	lensity Chart
CBR % at 2.54	1	12		17		22.		50.0	1	CBK & DIY C	lensity Chart
CBR % at 5.08		18		23		36.		45.0			
Correct CBR%@2		18		25		32.		40.0 35.0			
Compaction Rat	ite %							€ 30.0			
MDD (g/cm <sup>3</sup> ) (-)	)19mm			2.1	83			25.0			
OMC %				7.	8			15.0			
								10.0		I	
DJUSTED MDD	D(g/cm3										
DJUSTED MDD	O(g/cm3					CRP %		5.0			
DJUSTED MDD		doneity	2 07/			CBR %		5.0 0.0	.000 2.050	2.100	2.150 2.200 2.250 2.300
CBR @ 95 %	% Dry			gm/cm3		CBR % 21.8 % 30.0 %		5.0 0.0	.000 2.050	2.100 Dry Density	



Clie	ent.	ι	JSAID				Con	tractor.	TET	RA TECH		Jo	b No.	(	GO -21
Pro	ject.	C	Geotechnical Explorati	onn for Salang Tur	nel Substation, Afg	hanistan	Proj	ject No.	KSC	C-229		Sa	mple Date.	11/	10/2013
Pro	ject Locat	ion.	Parvan Province, Sa	lang Tunnel Sub	station		Sub	mitted to.	TET	RA TECH					
Mat	erial Sour	rce.	Test Pit No # 7				Soil	Descoription.	Silty	Sand with gravel					
Tes	t Pit No.		ΓP # 7	Wit	nessed by.		Con	tractor Rep.	San	pled by.		Sh	awal Lab by Fie	eld Team,	
Dep	oth of (M)	) 1	1.50 m	QTY	/. Represented,		1 Ba	ag Aprox (50 KG)							
		SIE	VE ANALYSIS	OF GRANUL	AR SOILS (AS	STM D 4	422)			TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LIN	IIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample E	Before Washing			g	ı	2516.2	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample A	After Washing			g		2403.2	В	Number of Bumps					
С	Wt. of Ma	at'Is Loss D	Ouring Washing (A -	B)		g		113.0	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 75µm (no. 200	)		g		4.5	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ntent			%		5.1	Е	Mass of Container	g				
	Sieve	Size	Weigth		% of	Whole	NO.	00501510451011	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g)	% fo retained	Passing	% Pas		SPECIFICATION	G	Mass of Dry soil (D - E)	q				
	3	76.2	0	0	100.0	100			Н	Moisture Content (F / G) x 100	%				
	2 1/2	63	0	0	100.0	100	0					TIC LIMIT			1
	2	50	0	0.0	100.0	100	0		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	214.6	8.5	91.5	91			С	Mass of Wet Soil and Container	g				
	1	25	305.6	12.1	87.9	88	3		D	Mass of Dry Soil & Container	g				
	3/4	19	396.7	15.8	84.2	84	ļ		Е	Mass of Container	g				
	1/2	12.5	497.5	19.8	80.2	80	)		F	Mass of Moisture (C - D)	g				
	3/8	9.5	525.9	20.9	79.1	79	)		G	Mass of Dry soil (D - E)	g				
	1/4	6.3	721.4	28.7	71.3	71			Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	1094.5	43.5	56.5	57			CL	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
	# 10	2.00	1879.5	74.7	25.3	25	5		OL.		. 701				
	# 40	0.425	1982.4	78.8	21.2	21				No of Blows / Moisture	Con	tent		nary of LL	,PL,PI
_	# 100	0.150		83.2	16.8	17				33.0	+	##	LL @ 25 Blov	vs	NP
	# 200	0.075		86.8	13.2	13		<u> </u>	8	31.0	+	##	Plastic Limit		NP
	100		article Size Distric	dution Curve			mary	of S,Analysis					Plasticity Inde		NP
	90		<del></del>	<del>-                                     </del>	<del>                                      </del>	Gravel		43.0 %	onte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557
e e	80					Sand		44.0 %	O	NON PLAS	н	#	OMC %		
Sie	60					%200 Si	eve	13.0 %	stur	25.0	#	##	MDD g/cc		
ing	50			9	<del>                                     </del>	N.Moistu		5.1	Mois	25.0				R (ASTM D	1883)
ass	40		<del>                                      </del>	<del>-   <b>/</b>                                      </del>	<del>                                     </del>			TICALE SIZE		21.0	$\pm$	田	CBR Det. @		
% Passing Sieve	30			<b>-</b>		<del></del>	DIAN	IETERS		10.0 Number of Blown		100.0	% EXPANSION		
	10	+			<del>                                     </del>	D 60			1	Number of Blows			CONSOLIDA	TION	
	0	+	11111	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	<u> </u>	D 30									
	C	0.01	0.1	10		D 10							La	b.Manage	<u>er</u>



										_			,			
Clie	ent.	ι	JSAID					Co	ntractor.	TET	RA TECH		Jo	b No.	(	GO -21
Pro	ject.	(	Geotechnical Explo	rationn for Sa	alang Tunr	nel Substation, Afg	hanista	n <b>Pro</b>	oject No.	KSC	C-229		Sa	mple Date.	11,	/10/2013
Pro	ject Locat	tion.	Parvan Province,	Salang Tun	nel Subs	tation		Su	bmitted to.	TET	RA TECH					
Mat	terial Soul	rce.	Test Pit No # 7	·				So	il Descoription.	Silty	Sand with gravel		·			
Tes	t Pit No.	-	TP # 7	·	Witn	essed by.		Co	ntractor Rep.	San	npled by.		Sh	awal Lab by Fie	eld Team,	
Dep	oth of (M)	) 2	2.25 m		QTY	. Represented,		1 B	ag Aprox (50 KG)							
		SIE	VE ANALYS	S OF GR	ANULA	R SOILS (AS	STM I	) 422 <u>)</u>			TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LI	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample E	Before Washing					g	2466.1	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample A	After Washing					g	2210.7	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss C	Ouring Washing (	A - B)				g	255.4	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 75µm (no. 2	200)				g	10.4	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ntent					%	5.6	Е	Mass of Container	g				
	Sieve	e Size	Weigth			% of	Wh	ole NO.	00501510451011	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM		retained	Passing	% F	assing	SPECIFICATION	G	Mass of Dry soil (D - E)	q				
	3	76.2	0		0	100.0	_	100		Н	Moisture Content (F / G) x 100	%		1		1
	2 1/2	63	0		0	100.0		100				AST	TIC LIMIT	•	1	
	2	50	0	(	0.0	100.0		100		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	0	(	0.0	100.0		100		С	Mass of Wet Soil and Container	g				
	1	25	125.4	Ę	5.1	94.9		95		D	Mass of Dry Soil & Container	g				
	3/4	19	255.4	1	0.4	89.6		90		Е	Mass of Container	g				
	1/2	12.5	327.9	1	3.3	86.7		87		F	Mass of Moisture (C - D)	g				
	3/8	9.5	455.7	1	8.5	81.5		82		G	Mass of Dry soil (D - E)	g				
	1/4	6.3	623.4	2	5.3	74.7		75		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	898.5		6.4	63.6		64		CL.	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
	# 10	2.00	1252.1		8.0	49.2		49		0_	Acciliation of Cole Actilia	01		, ,		
	# 40	0.425			5.2	24.8		25		9	No of Blows / Moisture	Con	tent		nary of LL	
-	# 100	0.150			2.4	17.6		18			33.0	+	##	LL @ 25 Blov	VS	NP
	# 200	0.075			7.4	12.6		13		(%)	31.0			Plastic Limit		NP
	100		article Size Dis		Curve	m m			of S,Analysis			$\pm$		Plasticity Inde		NP
	90		+++++	++++	++++++-	<del>*             </del>	Grave	l	36.0 %	onte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557
e e	80						Sand		51.0 %	Sec	NUNPLAS	н.		OMC %		
Sis	60	+			<b>4</b>	<del>                                     </del>		Sieve	13.0 %	stur	25.0	1	##	MDD g/cc		
ing	50	+++		<del>         </del>		<del>                                     </del>	N.Moi		5.6	Moi	25.0	+	##		R (ASTM D	1883)
% Passing Sieve	40	+	<del>                                      </del>		11111	<del>                   </del>	Th		RTICALE SIZE		21.0	1	田	CBR Det. @		
%	20				Ш			DIAI	METERS		10.0 Number of Blows		100.0	% EXPANSION		
	10	1		<del>            </del>		<del>                                     </del>	D 60	_			Number of Blows			CONSOLIDA	TION	
	0	+		Щ	11111	<u> </u>	D 30			-					L N4	
	C	0.01	0.1	1	10		D 10							<u>La</u>	b.Manage	<u>er</u>



Cli	ent.		USAII	D				Со	ntractor.	TE.	FRA TECH		Jo	b No.	(	GO -21
Pro	oject.		Geote	chnical Exploration	nn for Salang Tunr	nel Substation, Afg	hanista	n <b>Pro</b>	oject No.	KS	C-229		Sa	mple Date.	11	/10/2013
Pro	ject Locat	tion.	Parva	n Province, Sala	ng Tunnel Subs	tation		Su	bmitted to.	TE	FRA TECH				·	
Ма	terial Soul	rce.	Test F	Pit No # 7				So	il Descoription.	Silt	y Sand with gravel					
Tes	st Pit No.		TP#	7	Witn	essed by.		Co	ntractor Rep.	Sar	npled by.		Sh	awal Lab by Fie	eld Team,	
De	pth of ( M )	)	3.00 r	n	QTY	. Represented,		1 B	Bag Aprox (50 KG)							
		SIE	VE A	ANALYSIS O	F GRANULA	R SOILS (A	STM	D 422)			TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LII	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample l	Before	e Washing				g	2551.4	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After \	Washing				g	2133.9	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss [	During	y Washing (A - E	3)			g	417.5	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 7	75µm (no. 200)				g	16.4	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ontent					%	6.9	Е	Mass of Container	g				
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	Passing	% I	Passing	3 ECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		0	0	100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		0	0	100.0		100			PL	.AST	TIC LIMIT			
	2	50		0	0.0	100.0		100		Α	Container No		4 D	4 D	Ave	erage
	1 1/2	37.5		0	0.0	100.0		100		С	Mass of Wet Soil and Container	g				
	1	25		194.6	7.6	92.4		92		D	Mass of Dry Soil & Container	g				
	3/4	19		233.7	9.2	90.8		91		Е	Mass of Container	g				
	1/2	12.5		365.9	14.3	85.7		86		F	Mass of Moisture (C - D)	g				
	3/8	9.5		589.7	23.1	76.9		77		G	Mass of Dry soil (D - E)	g				
	1/4	6.3		1065.1	41.7	58.3		58		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75		1229.7	48.2	51.8		52		CL	ASSIFICATION OF SOIL ASTM D 2	2487		(SM)	Silty Sand	with gravel
	# 10	2.00	_	1396.8	54.7	45.3		45						1 0		DI DI
	# 40	0.425		1784.2	69.9	30.1		30		-	33.0 7 No of Blows / Moisture	Con	tent		nary of LL	
	# 100	0.150		1965.3	77.0	23.0		23					##	LL @ 25 Blov	WS	NP
-	# 200	0.075		2015.6	79.0	21.0	e		of S,Analysis	8	31.0	#	##	Plastic Limit		NP
	100	Pa	artici 	e Size Distridu	Ition Curve	TOP MINI				ent	29.0	#	##	Plasticity Inde		NP
	90 80					<u> </u>	Grave		48.0 %	onto	29.0 NON PLAS	H		MOISTURE-	DENSITY (A	(1557)
	70		ШШ				Sand	Sieve	31.0 %	Sec	25.0			OMC %		
نَ	60		Ш			<del>                                     </del>	-		21.0 %	Stu	25.0			MDD g/cc	A CTM D	4002\
	50		<del>             </del>		<del>\$                                      </del>	<del>                                      </del>		isture	6.9 RTICALE SIZE	Mo	23.0	#	##		R (ASTM D	1003)
% Dassing Sieve	40 30		Ш				"		METERS		21.0	_	Ш,	CBR Det. @		
8			$\square$		<del>-                                     </del>	<del>                                     </del>	D 60		WILTERS		10.0 Number of Blows		100.0	CONSOLIDA		
	10	+++	$\left\{ \cdot\right\} \left\{ \cdot\right\} $	<del>                                     </del>	<del>-                                       </del>	<del>                                     </del>	D 30							CONTROLIDA		
	0	+		<del>                                     </del>		<u> </u>	D 30			1				وا	b.Manage	≥r
	(	0.01	0	.1 1	10		D 10							<u>La</u>	<u>v.iviariay</u> i	<u> </u>
							<u> </u>			<u> </u>						



		•										1			
Clie	ent.	U	SAID				Conti	ractor.	TET	RA TECH		Jol	No.	(	GO -21
Pro	ject.	G	eotechnical Exploration	onn for Salang Tun	nel Substation, Afg	hanistan	Proje	ect No.	KSC	-229		Sa	mple Date.	11.	10/2013
Pro	ject Locat	tion. P	arvan Province, Sal	ang Tunnel Subs	station		Subm	nitted to.	TET	RA TECH					
Mat	erial Sour	rce. T	est Pit No #8				Soil [	Descoription.	Silty	Sand with gravel					
Tes	t Pit No.	Т	P#8	Witr	nessed by.		Contr	actor Rep.	Sam	pled by.		Sh	awal Lab by Fie	eld Team,	
Dep	th of (M)	) 0	75 m	QTY	. Represented,		1 Bag	g Aprox (50 KG)							
		SIE\	E ANALYSIS C	OF GRANUL	AR SOILS (AS	STM D 4	122)			TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LIN	IIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample B	efore Washing			g		2448.0	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample A	ter Washing			g		1824.4	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss Di	ıring Washing (A -	B)		g		623.6	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pass	ing 75µm (no. 200)			g		25.5	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Cor	tent			%		2.6	Е	Mass of Container	g				
	Sieve	e Size	Weigth		% of	Whole	NO.	0050151045104	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g)	% fo retained	Passing	% Pas		SPECIFICATION	G	Mass of Dry soil (D - E)	q				
	3	76.2	0	0	100.0	100			Н	Moisture Content (F / G) x 100	%				1
	2 1/2	63	0	0	100.0	100	)				AST	IC LIMIT			
	2	50	0	0.0	100.0	100	)		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	0	0.0	100.0	100	)		С	Mass of Wet Soil and Container	g				
	1	25	97.7	4.0	96.0	96	i		D	Mass of Dry Soil & Container	g				
	3/4	19	139.4	5.7	94.3	94			Е	Mass of Container	g				
	1/2	12.5	182.3	7.4	92.6	93			F	Mass of Moisture (C - D)	g				
	3/8	9.5	206.6	8.4	91.6	92			G	Mass of Dry soil (D - E)	g				
	1/4	6.3	262.4	10.7	89.3	89			Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	424.1	17.3	82.7	83	1		CL A	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
	# 10	2.00	709.6	29.0	71.0	71			0_,						
	# 40	0.425	1330.4	54.3	45.7	46				No of Blows / Moisture	Con	tent		nary of LL	
-	# 100	0.150	1656.8	67.7	32.3	32				33.0	+	##	LL @ 25 Blov	VS	NP
	# 200	0.075	1818.8	74.3	25.7	26			8	31.0	-		Plastic Limit		NP
	100		ticle Size Distrid	ution Curve			nary o	of S,Analysis			$\pm$		Plasticity Inde		NP
	90		<del>                                      </del>		<del>7~             </del>	Gravel		17.0 %	onte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557
Š	80 70					Sand		57.0 %	Sec	INUINFLAS	HIL	##	OMC %		
Sis	60		<del>                                      </del>		<del>                                     </del>	%200 Sie		26.0 %	stur.	25.0	#	##	MDD g/cc		
ing	50				<del>                                     </del>	N.Moistu		2.6	No	25.0		##		R (ASTM D	1883)
ass	40 30			<del>-                         -            </del>	<del>                                     </del>			TICALE SIZE		21.0	1	田	CBR Det. @		
% Passing Sieve	20						DIAME	ETERS		10.0 Number of Blows		100.0	% EXPANSION		
	10		<del>                </del>	<del>-                                     </del>	<del>                                     </del>	D 60				Number of Blows			CONSOLIDA	TION	
	0	+ + + + + + + + + + + + + + + + + + + +				D 30									
	C	0.01	0.1 1	10		D 10							La	b.Manage	<u>er</u>
1			_	_					I						



										1						
Clie	ent.		USAID					Co	ntractor.	TE	RA TECH		Jo	b No.	(	GO -21
Pro	ject.		Geotechnical Explor	ationn for Salar	ıg Tunne	el Substation, Afg	hanista	n <b>Pro</b>	oject No.	KS	C-229		Sa	mple Date.	11.	/10/2013
Pro	ject Locat	tion.	Parvan Province,	Salang Tunnel	Substa	ation		Su	bmitted to.	TE	RA TECH					
Mat	erial Sou	rce.	Test Pit No # 8					So	il Descoription.	Silty	Sand with gravel					
Tes	t Pit No.		TP # 8		Witne	ssed by.		Co	ntractor Rep.	San	npled by.		Sh	awal Lab by Fie	eld Team,	
Dep	oth of (M)	)	1.50 m		QTY.	Represented,		1 B	ag Aprox (50 KG)							
		SIE	VE ANALYSIS	OF GRAN	IULAI	R SOILS (AS	TM [	) 422 <u>)</u>			TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LI	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample I	Before Washing					g	2613.7	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample /	After Washing					g	2249.8	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss D	During Washing (A	B)				g	363.9	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 75µm (no. 20	10)				g	13.9	D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ontent				ď	%	4.3	Е	Mass of Container	g				
	Sieve	e Size	Weigth			% of	Who	ole NO.	00501510451011	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(	) % fo reta	ined	Passing	% F	assing	SPECIFICATION	G	Mass of Dry soil (D - E)	q				
	3	76.2	0	0		100.0		100		Н	Moisture Content (F / G) x 100	%		1		1
	2 1/2	63	0	0		100.0		100				AST	TIC LIMIT	•		
	2	50	0	0.0		100.0		100		Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	165.6	6.3		93.7		94		С	Mass of Wet Soil and Container	g				
	1	25	256.7	9.8		90.2		90		D	Mass of Dry Soil & Container	g				
	3/4	19	345.3	13.2	:	86.8		87		Е	Mass of Container	g				
	1/2	12.5	466.7	17.9	)	82.1		82		F	Mass of Moisture (C - D)	g				
	3/8	9.5	597.8	22.9	)	77.1		77		G	Mass of Dry soil (D - E)	g				
	1/4	6.3	734.1	28.1		71.9		72		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75	1019.7	39.0		61.0		61		CI	ASSIFICATION OF SOIL ASTM D 2	487		(SM)	Silty Sand	with gravel
	# 10	2.00	1645.2	62.9		37.1		37		<u> </u>	Acciliant of Coll Actilia			, ,		
	# 40	0.425		71.7		28.3		28			No of Blows / Moisture	Con	tent		nary of LL	
_	# 100	0.150		76.5		23.5		24		-	33.0	+	##	LL @ 25 Blov	VS	NP
	# 200	0.075	II.	82.9		17.1		17		(%)	31.0			Plastic Limit		NP
	100	Pa	article Size Dist		ve 				of S,Analysis					Plasticity Inde		NP
	90				$\parallel \prec $	<b>411111</b>	Grave	l	39.0 %	orte	29.0 NON PLAS			MOISTURE-	DENSITY (A	STM D1557
, e	80						Sand		44.0 %	Sec	INCIN PLAS	-		OMC %		
Sis	60				$\parallel \parallel \perp$			Sieve	17.0 %	stri	25.0	#	##	MDD g/cc		
ing	50			<del>     //  </del>	+	<del>-                                     </del>	N.Moi		4.3	Mo	25.0				R (ASTM D	1883)
% Passing Sieve	40					<del>                                     </del>	TH		RTICALE SIZE		21.0	1	##	CBR Det. @		
%	20				-		_	DIAI	METERS	-	10.0 Number of Blows		100.0	% EXPANSION		
	10	+++			-	<del>-                                     </del>	D 60				Humber of blows			CONSOLIDA	TION	
	0	+++	<del>                                      </del>	Щ	Щ	<u> </u>	D 30			4					- N/	
	C	0.01	0.1	1	10		D 10							<u>La</u>	b.Manage	<u>er</u>



Clie	ent		USAID				Contractor.	TF	TRA TECH		In	b No.	(	GO -21
	ject.		Geotechnical Exploration	onn for Colona T	Funnal Substation Ata	hanistan	Project No.	+	C-229			mple Date.		10/2013
_	•					nanistan	† - *	+			Sa	mpie Date.	1 1/	10/2013
	ject Locat		Parvan Province, Sal	lang Tunnel St	ubstation		Submitted to.	+	TRA TECH					
	terial Sour		Test Pit No # 8	l			Soil Descoription.	+	ulder		I <sub>a</sub> .			
_	t Pit No.		TP#8		/itnessed by.		Contractor Rep.	Sai	mpled by.		Sh	awal Lab by Fie	eld I eam,	
Dep	oth of (M)		2.25 m		TY. Represented,	T14 D 4	00 )						/A 0=14 B	10.10.
	I		VE ANALYSIS (	JF GRANU	LAR SUILS (AS		<u> </u>	<del> </del>	TEST REPORT LIQUID LIMIT AN	וץ ט				1
Α			Before Washing			g		A	Container No		4 D	2 D	3 D	4 D
В	+		After Washing			g		В	Number of Bumps					
С			During Washing (A -			g		С	Mass of Wet Soil and Container	g				
D			sing 75µm (no. 200)			g		D	Mass of Dry Soil & Container	g				
E	Natural M				1	%		Е	Mass of Container	g				
	Sieve	Size	Weigth	<u> </u>	% of	Whole I	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g)	% fo retaine	ed Passing	% Pass		G	Mass of Dry soil (D - E)	g				
	3	76.2						Н	Moisture Content (F / G) x 100	%				
	2 1/2	63							<u>PL</u>	AS1	TIC LIMIT			
	2	50						Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5						С	Mass of Wet Soil and Container	g				
	1	25						D	Mass of Dry Soil & Container	g				
	3/4	19						Е	Mass of Container	g				
	1/2	12.5		<b>BO</b>	ulder			F	Mass of Moisture (C - D)	g				
	3/8	9.5						G	Mass of Dry soil (D - E)	g				
	1/4	6.3						Н	Moisture Content (F / G) x 100	%				
	# 4	4.75						CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	lder
	# 10	2.00												D. D.
	# 40	0.425						-	33.0 7 No of Blows / Moisture (	Cont	ent		nary of LL	•
_	# 100	0.150									#	LL @ 25 Blov	WS	NP
	# 200	0.075		<u> </u>		•		8	31.0			Plastic Limit		NP
	100	P;	article Size Distrid	lution Curve	·		nary of S,Analysis			$\pm$		Plasticity Inde		NP
	90	+++		<del>-                                     </del>	<del></del>	Gravel		onte	29.0 NON PLAST	10			DENSITY (A	STM D1557)
٩	80 70					Sand		e Co	INUIN PLAS!	1	#	OMC %		
Sie	60					%200 Sie	ve	tur	25.0			MDD g/cc		
ğ	50	+		<del>-                                      </del>	<del></del>	N.Moistur		Nois	25.0				R (ASTM D1	883)
SS	40	+	<del>                                     </del>	<del>-                                     </del>	<del>-                                     </del>		PARTICALE SIZE	~	21.0	$\pm$	曲	CBR Det. @	95 of MDD	
" Passing Sieve	30			<del>-                                      </del>	<del>-                                     </del>		DIAMETERS		10.0		100.0	% EXPANSI		
•	10					D 60		5	Number of Blows		100.0	CONSOLIDA	ATION	
	0	+				D 30								
	(	0.01	0.1 1	. 10	n	D 10						<u>La</u>	<u>b.Manage</u>	<u>er</u>
L		,.J1		. 10		טו כו								



Clie	ent.		USAID					Co	ntractor.	TE	TRA TECH		Jo	ob No.	G	O -21
Pro	ject.		Geotechnical Explo	rationn for S	alang Tun	nel Substation, Afg	hanista	n <b>Pro</b>	oject No.	KS	C-229		Sa	ample Date.	11/	10/2013
Pro	ject Locat	ion.	Parvan Province,	Salang Tur	nel Subs	tation		Su	bmitted to.	TE	FRA TECH					
Mat	terial Sour	rce.	Test Pit No # 8					So	il Descoription.	Βοι	ılder					
Tes	t Pit No.		TP#8		Witn	essed by.		Co	ntractor Rep.	Sar	npled by.		Sh	nawal Lab by Fie	eld Team,	
Dep	oth of (M)	,	3.00 m			. Represented,										
		SIE	VE ANALYSI	S OF GR	ANULA	AR SOILS (AS	STM [	422			TEST REPORT LIQUID LIMIT AN	D Pl	LASTIC LI	MIT OF SOIL	(ASTM D 4	318)
Α	Wt. of Dr	y Sample	Before Washing					g		Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After Washing					g		В	Number of Bumps					
С	Wt. of Ma	at'Is Loss I	During Washing (	4 - B)				g		С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	ssing 75µm (no. 2	00)				g		D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ontent				Ç	%		Е	Mass of Container	g				
	Sieve	Size	Weigth			% of	Who	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(	g) % fo	retained	Passing	% P	assing	J SFECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2								Н	Moisture Content (F / G) x 100	%				
	2 1/2	63									PL	.AST	TIC LIMIT			
	2	50								Α	Container No		4 D	4 D	Aver	age
	1 1/2	37.5								С	Mass of Wet Soil and Container	g				
	1	25								D	Mass of Dry Soil & Container	g				
	3/4	19								Е	Mass of Container	g				
	1/2	12.5								F	Mass of Moisture (C - D)	g				
	3/8	9.5			lou	der				G	Mass of Dry soil (D - E)	g				
	1/4	6.3								Н	Moisture Content (F / G) x 100	%				
	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	2487		Boulder	Boul	der
	# 10	2.00												1 0		DI DI
	# 40	0.425							1	ľ	No of Blows / Moisture (	Cont	ent		nary of LL,	
	# 100	0.150											#	LL @ 25 Blov	VS	NP
-	# 200	0.075	l e e e e e e e e e e e e e e e e e e e				C		of C Analysis	(%)	31.0		#	Plastic Limit		NP
	100	P	article Size Dist	ridution (	liiii	ТППП			of S,Analysis	THE	29.0			Plasticity Inde		NP
	90		<del>                                      </del>		<del>                                      </del>	<del>                                     </del>	Grave	l		ontio	29.0 NON PLAST	10	#		DENSITY (AS	STM D1557)
eve	70						Sand	0:		De	25.0	*	#	OMC %		
Sign	60	+			+HHH-	<del>                                     </del>	%200			stril	28.0			MDD g/cc	\	000)
ing	50		<del>                                      </del>	<del>IIII        </del>	<del>      </del>	<del>                                     </del>	N.Moi		DTION FOITE	Mo	25.0				R (ASTM D1	883)
% Passing Sieve	40								RTICALE SIZE		21.0	$\pm$	Ш,	CBR Det. @		
%	20	+				<del>                                     </del>	D 00	DIA	METERS	-	10.0 Number of Blows		100.0	% EXPANSION CONSOLIDA		
	10	+++			+HHH-	<del>                                     </del>	D 60				Hamber of Brown			CONSOLIDA	TION	
	0	+	<del>''''                                  </del>			<del> </del>	D 30			-				اما	h Managa	,
	C	0.01	0.1	1	10		D 10							<u>La</u>	b.Manage	<u>l</u>
<u> </u>							<u> </u>									



Project  P #  Horizontal Gage Shear Displacement			l Explorationn fo			1						
Horizontal			2 Depth(m)		Substation,	Testing Dat	ө			19/11/201	3	
Gage Shear		•	2	Depth(m)	1.5	Tested By				Hikmat		
Gage Shear		Sample	e No. 1			Sample	No. 2			Samp	le No. 3	
	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stres
(0.01 mm)	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2
0.0	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000
25.0	0.09	0.22	1.25	0.012046	0.12	1.48	1.27	0.012236	0.13	2.78	2.31	0.022223
50.0	0.12	1.51	2.82	0.027149	0.15	2.71	2.26	0.021685	0.15	6.91	5.61	0.053953
75.0	0.14	4.71	5.38	0.051734	0.18	6.81	5.53	0.053185	0.18	10.01	8.09	0.077769
100.0	0.17	5.81	6.26	0.060185	0.20	9.61	7.77	0.074696	0.21	16.11	12.96	0.124634
125.0	0.18	7.01	7.22	0.069404	0.23	11.61	9.37	0.090061	0.23	21.21	17.04	0.163815
150.0	0.20	8.81	8.66	0.083233	0.24	15.71	12.64	0.121560	0.27	25.91	20.79	0.199924
175.0	0.22	9.71	9.38	0.090147	0.26	18.11	14.56	0.139999	0.31	31.11	24.95	0.239874
200.0	0.23	10.11	9.69	0.093220	0.28	20.61	16.56	0.159206	0.36	34.61	27.74	0.266763
250.0	0.25	12.11	11.29	0.108585	0.30	22.91	18.40	0.176876	0.41	38.71	31.02	0.298262
300.0	0.26	14.31	13.05	0.125487	0.32	25.71	20.63	0.198387	0.45	40.01	32.06	0.308250
400.0	0.28	14.61	13.29	0.127792	0.35	28.81	23.11	0.222204	0.52	44.11	35.33	0.339749
500.0	0.30	16.21	14.57	0.140085	0.37	29.91	23.99	0.230655	0.55	46.51	37.25	0.358187
600.0	0.30	16.21	14.57	0.140085	0.40	30.41	24.39	0.234496	0.57	48.21	38.61	0.371248
700.0	0.29	15.01	13.61	0.130865	0.40	30.41	24.39	0.234496	0.57	48.21	38.61	0.371248
800.0	0.28	14.81	13.45	0.129329	0.39	30.01	24.07	0.231423	0.56	46.81	37.49	0.360492
900.0	0.27	14.01	12.81	0.123183	0.39	29.61	23.75	0.228350	0.56	46.61	37.33	0.358956
1000.0	0.27	13.71	12.57	0.120878	0.38	29.01	23.27	0.223740	0.55	46.11	36.93	0.355114
Description of Se	oil (Class)			ML		Strain Rate				0.5 mm/mi	'n	
ample No.			1	2	3	Type of Tes	st			CD		
lormal Stress, k	kg/cm²		0.244500	0.486900	0.734600	Proving Rin	g Calibration	Factor			0.52	kg/Div



Company		TETRA TE	ECH	Sampling Date	10/11/2013
Project	Geotechnical E	xplorationn for Salang Province, Afgha	g Tunnel Substation, Parwan anistan	Testing Date	19/11/2013
TP#	2	Depth(m)	1.5	Description of Soil	ML

### DIRECT SHEAR TEST (ASTM D3080)

Type of Test		CD	
Strain Rate		0.5 mm/min	
Sample No.	1	2	3
Normal Stress, kg/cm²	0.244500	0.486900	0.734600

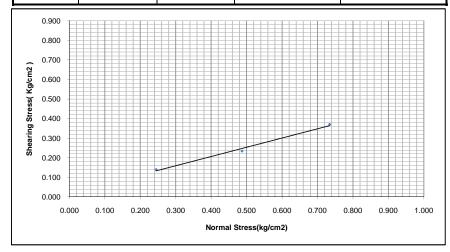
### SOIL SPECIMEN MEASUREMENTS

Diameter	(cm)	10.2	10.2	10.2
Height	(cm)	2	2	2
Area	(cm²)	104.04	104.04	104.04
Volume	(cm³)	208.08	208.08	208.08
Weight of Soil + Split Former	(g)	488.4127101	489.5127101	488.1127101
Weight of Split Former	(g)	131.4	131.4	131.4
Weight of Soil	(g)	357.0127101	358.1127101	356.7127101
Wet Unit Weight	(kg/cm3)	1.715747357	1.721033786	1.714305604
Dry Unit Weight	(kg/cm3)	1.642023838	1.647519606	1.638382107

### WATER CONTENT DETERMINATION

Container No.		1	2	3.00
Weight of Wet Soil + Container	(g)	124.9	138.7	142.6
Weight of Dry Soil + Container	(g)	120.9	134.3	137.8
Weight of Water	(g)	3.982	4.4	4.85
Weight of Container	(g)	32.198	35.71	33.13
Weight of Dry Soil	(g)	88.69	98.608	104.66
Water Content	(%)	4.49	4.46	4.63

Sample No.	Water C	ontent %	Normal Stress kg/cm <sup>2</sup>	Max. Shearing Stress
Cample No.	before test	after test	Normal Stress kg/cm	kg/cm2
1	4.49	4.26	0.244500	0.140085
2	4.46	4.10	0.486900	0.228350
3	4.63	4.22	0.734600	0.360492



Cohesion, $C=$	1.86	Kpa
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🛇 Angle =	25.2°	Degree
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Company			TETRA	TECH		Sampling Da	ate			11/11/2013					
Project		Geotechnica	Explorationn for Parwan Province			Testing Date	9		19/11/2013						
TP#			8	Depth(m)	1.5	Tested By		Hikmat							
Horizontal		Sample	No. 1			Sample I	No. 2			Sampl	e No. 3				
Gage Shear Displacement	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress			
(0.01 mm)	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2			
0.0	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000			
25.0	0.01	4.50	3.60	0.035599	0.03	6.10	4.87	0.048256	0.09	11.30	9.03	0.089393			
50.0	0.03	5.80	4.63	0.045883	0.08	8.50	6.79	0.067243	0.13	16.20	12.94	0.128156			
75.0	0.05	7.10	5.67	0.056167	0.11	10.60	8.47	0.083855	0.16	21.10	16.86	0.166920			
100.0	0.08	10.40	8.31	0.082273	0.13	14.30	11.43	0.113126	0.20	26.30	21.01	0.208056			
125.0	0.11	13.20	10.55	0.104424	0.104424 0.15	18.40	14.70	0.145560	0.24	32.40	25.89	0.256313			
150.0	0.15	15.20	12.14	0.120246	0.17	22.70	18.14	0.179577 0.27		37.60	30.04	0.297450			
175.0	0.17	18.60	14.86	0.147143	0.19	24.20	19.34	0.191444	0.29	41.50	33.16	0.328302			
200.0	0.19	20.60	16.46	0.162964	0.23	28.30	22.61	0.223878	0.33	47.30	37.79	0.374185			
250.0	0.21	21.30	17.02	0.168502	0.26	30.20	24.13	0.238909	0.36	55.40	44.26	0.438263			
300.0	0.23	22.10	17.66	0.174831	0.30	34.20	27.33	0.270552	0.38	60.50	48.34	0.478609			
400.0	0.25	23.60	18.86	0.186697	0.33	38.20	30.52	0.302196	0.41	62.30	49.78	0.492849			
500.0	0.25	23.60	18.86	0.186697	0.35	40.50	32.36	0.320391	0.43	65.30	52.17	0.516581			
600.0	0.25	22.40	17.90	0.177204	0.35	40.20	32.12	0.318018	0.46	67.30	53.77	0.532403			
700.0	0.24	22.00	17.58	0.174040	0.34	39.60	31.64	0.313271	0.46	67.30	53.77	0.532403			
800.0	0.24	21.80	17.42	0.172457	0.34	39.10	31.24	0.309316	0.45	66.70	53.29	0.527656			
900.0	0.23	21.30	17.02	0.168502	0.33	38.40	30.68	0.303778	0.45	66.10	52.81	0.522910			
1000.0	0.22	20.50	16.38	0.162173	0.33	38.10	30.44	0.301405	0.44	65.50	52.33	0.518163			
Description of Soil (Class)				SM		Strain Rate		0.5 mm/m	nin						
Sample No.			1	2	3	Type of Tes	t			CD					
Normal Stress, kg/cm <sup>2</sup> 0.244500 0.4865					0.734600	Proving Rin	g Calibration		0.52 kg/Div						



Company		TETRA T	ECH	Sampling Date	11/11/2013
Project	Geotechnical Ex	plorationn for Salar Province, Afgl	ng Tunnel Substation, Parwan nanistan	Testing Date	19/11/2013
TP#	8	Depth(m)	1.5	Description of Soil	SM

### DIRECT SHEAR TEST (ASTM D3080)

Type of Test	CD							
Strain Rate	0.5 mm/min							
Sample No.	1	2	3					
Normal Stress, kg/cm²	0.244500	0.486900	0.734600					

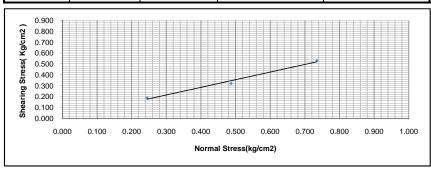
#### SOIL SPECIMEN MEASUREMENTS

Diameter	(cm)	9.99	9.99	9.99
Height	(cm)	2	2	2
Area	(cm²)	99.8	99.8	99.8
Volume	(cm³)	199.6	199.6	199.6
Weight of Soil + Split Former	(g)	464.5	466.0	463.3
Weight of Split Former	(g)	119	119	119
Weight of Soil	(g)	345.53	347.03	344.33
Wet Unit Weight	(kg/cm3)	1.73	1.74	1.73
Dry Unit Weight	(kg/cm3)	1.66	1.66	1.65

#### WATER CONTENT DETERMINATION

Container No.		1	2	3.00
Weight of Wet Soil + Container	(g)	122.2	136.2	139.7
Weight of Dry Soil + Container	(g)	118.3	131.8	135.2
Weight of Water	(g)	3.852	4.46	4.51
Weight of Container	(g)	32.198	35.71	33.13
Weight of Dry Soil	(g)	86.14	96.058	102.11
Water Content	(%)	4.47	4.64	4.42

Sample No.	Water (	Content %	Normal Stress kg/cm <sup>2</sup>	Max. Shearing Stress kg/cm2			
	before test	after test					
1	4.47	4.24	0.244500	0.186697			
2	4.64	4.28	0.486900	0.320391			
3	4.42	4.01	0.734600	0.532403			



Cohesion, $C =$	0.000	Kg/cm2	
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S Angle =	33.4	Degree



### **Shawal GEMTL**

Shawal Geotechnical Engineering / Materials Testing Laboratory

# Appendix F

Boreholes Laboratory Soil Test Results

Shawal Geotechnical & Material Testing Laboratory



Cli	ent.		USAI	AID Contractor.				ontractor.	TETRA TECH				b No.	(	GO -21		
Pro	oject.		Geote	chnical Exploration	nn for Salang Tunr	nel Substation, Afg	hanista	an <b>Pr</b>	oject No.	KS	C-229		Sa	mple Date.	11.	/11/2013	
Pro	oject Locat	tion.	Parva	n Province, Sala	ang Tunnel Subs	tation		Su	ıbmitted to.	-							
Ma	terial Sour	rce.	Bore	Hole No # 2				So	il Descoription.	Silty	Sand with gravel						
Во	re Hole		BH#	2	Witn	essed by.		Co	ontractor Rep.	Sar	npled by.		Sh	awal Lab by Fie	Field Team,		
De	pth of (M)	)	0.75 r	m	QTY	. Represented,		1 E	Bag Aprox (50 KG)								
		SIE	VE /	ANALYSIS O	F GRANULA	R SOILS (AS	MT	D 422	)		TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LII	MIT OF SOIL	(ASTM D	4318)	
Α	Wt. of Dr	ry Sample	Before	e Washing				g	2675.2	Α	Container No		4 D	2 D	3 D	4 D	
В	Wt. of Dr	ry Sample	After \	Washing				g	1436.4	В	Number of Bumps						
С	Wt. of Ma	at'ls Loss I	During	g Washing (A - E	3)			g	1238.8	С	Mass of Wet Soil and Container	g					
D	%tage of	Mat'ls Pas	ssing	75µm (no. 200)				g	46.3	D	Mass of Dry Soil & Container	g					
Е	Natural M	Noisture Co	ontent					%	4.3	Е	Mass of Container	g					
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g					
	Inch	mm Ret CUM(g) % fo retained Passing % Pa		Passing	JONE CIFICATION	G	Mass of Dry soil (D - E)	g									
	3	76.2		0	0	100.0		100		Н	Moisture Content (F / G) x 100	%					
	2 1/2	63		0	0	100.0		100			PL	.AST	IC LIMIT	T			
	2	50		0	0.0	100.0		100		Α	Container No		4 D	4 D	Ave	rage	
	1 1/2	37.5		103.5	3.9	96.1		96		С	Mass of Wet Soil and Container	g					
	1	25		255.2	9.5	90.5		90		D	Mass of Dry Soil & Container	g					
	3/4	19		382.1	14.3	85.7		86		Е	Mass of Container	g					
	1/2	12.5		432.5	16.2	83.8		84		F	Mass of Moisture (C - D)	g					
	3/8	9.5		455.9	17.0	83.0		83		G	, , , ,						
	1/4	6.3		502.4	18.8	81.2		81		Н	Moisture Content (F / G) x 100 %						
	# 4	4.75		540.8	20.2	79.8		80		CL	ASSIFICATION OF SOIL ASTM D 2	487		(SM) Silty		ty Sand with gravel	
	# 10	2.00	_	740.2	27.7	72.3		72								DI DI	
-	# 40	0.425		1074.9	40.2	59.8		60			No of Blows / Moisture	Con	tent		nary of LL		
-	# 100 # 200	0.150		1391.5	52.0 64.9	48.0 35.1		48 35		-			##	LL @ 25 Blov	VS	NP NP	
-		0.075		1735.9		35.1	e		of S,Analysis	(%)	31.0	#		Plastic Limit		NP NP	
	100	P	artici	le Size Distridu	Tion Curve				1	ent	29.0	#	#	Plasticity Inde			
	90 80 u						Grave Sand		20.0 % 45.0 %	ont	29.0 NON PLAS	FIC		OMC %	DENSIIT (A	3 IWI D1337)	
	70		ШШ			<del>                                     </del>		) Sieve	35.0 %	rec	25.0						
Ü	<u>5</u> 60					<del>                                     </del>		isture		Stu	25.0	$\pm$		MDD g/cc	R (ASTM D	1002\	
1	50		111111	<del></del>	<del>-                                     </del>	<del>                 </del>			4.3 RTICALE SIZE	Mo	23.0	#	##		•	1003)	
6	70 60 50 40 30 88						''		METERS		21.0	_	Ш,	CBR Det. @ % EXPANSION			
8		+++		<del>                                     </del>	<del>-                                     </del>	<del>                                     </del>	D 60		IVILIENS		10.0 Number of Blows		100.0	CONSOLIDA			
	_	10 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			+ +						***						
	0	1		1						ł				اء ا	b.Manage	2r	
	C	0.01	0	.1 1	10		D 10							<u>La</u>	J.IVIAITAYE	<u>"</u>	
										<u> </u>							



Cli	ent.		USAII	D				Co	ntractor.	TETRA TECH				Job No.		GO -21	
Pro	oject.		Geote	chnical Exploratio	nn for Salang	Tunnel Substation, Afg	hanistan	Pro	ject No.	KS	C-229		Sar	mple Date.	11/	11/2013	
Pro	oject Locat	tion.	Parva	n Province, Sala	ang Tunnel S	Substation		Sul	Submitted to. TETRA TECH			-					
Ma	terial Soul	rce.	Bore I	Hole No # 2	5 Soil Descoription. Boulder												
Bore Hole BH # 2 Witnessed by.							Cor	Contractor Rep. Sampled by. Shawal Lab by Field Team						d Team,			
De	pth of (M)	)	1.50 n	n		QTY. Represented,											
		SIE	VE A	ANALYSIS O	F GRAN	ULAR SOILS (A	STM D	422)			TEST REPORT LIQUID LIMIT AN	D PLA	ASTIC LIN	IIT OF SOIL	(ASTM D 4	1318)	
Α	Wt. of Dr	y Sample	Before	e Washing			(	3		Α	Container No		4 D	2 D	3 D	4 D	
В	Wt. of Dr	y Sample	After \	Nashing			Ç	9		В	Number of Bumps						
С	Wt. of Ma	at'ls Loss	During	Washing (A - E	3)		(	9		С	Mass of Wet Soil and Container	g					
D	%tage of	Mat'ls Pa	ssing 7	75µm (no. 200)			(	9		D	Mass of Dry Soil & Container	g					
Е	Natural M	loisture C	ontent				%			Е	Mass of Container	g					
	Sieve	Size		Weigth		% of	Whole	e NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g					
	Inch	mm		Ret CUM(g)	% fo retair	ned Passing	% Pa	ssing	SPECIFICATION	G	Mass of Dry soil (D - E)	g					
	3	76.2		(0)		, and the second				Н	Moisture Content (F / G) x 100	%					
	2 1/2	63									PL	ASTI	C LIMIT			•	
	2	50								Α	Container No		4 D	4 D	Avei	rage	
	1 1/2	37.5								С	Mass of Wet Soil and Container	g					
	1	25								D	Mass of Dry Soil & Container	g					
	3/4	19			6					Е	Mass of Container	g					
	1/2	12.5			Ď	<u>oulder</u>				F	Mass of Moisture (C - D)	g					
	3/8	9.5								G	Mass of Dry soil (D - E)	g					
	1/4	6.3								Н	Moisture Content (F / G) x 100	%					
	# 4	4.75								CI	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	lder	
	# 10	2.00								<u> </u>							
	# 40	0.42									No of Blows / Moisture	Conte	ent		ary of LL,	PL,PI	
	# 100	0.150										#	#	LL @ 25 Blows	3		
	# 200	0.07							(0.4 ) .	(%)	31.0		#	Plastic Limit			
	100	P	articl	e Size Distridı	ution Curv	e II IIII		mary	of S,Analysis	E	29.0	$\blacksquare$	#	Plasticity Index			
	90	+++	++++		<del>-                </del>		Gravel			onte	27.0 NONDIAS		#	MOISTURE-D	ENSITY (AS	STM D1557)	
	80 70						Sand			Se	INCHI PLAS	-	#	OMC %			
;	60	+			<del>-                                     </del>		%200 S			stur	25.0	$\blacksquare$	#	MDD g/cc			
3	70 60 50 40 30 20	+++	++++++		<del>-                       </del>	<del>                                     </del>	N.Moist			Moi	29.0 NON PLAS 25.0 23.0		#		(ASTM D1	883)	
	<b>2</b> 40 30		<del>             </del>		<del>-                                       </del>	<del>                                     </del>	THE		RTICALE SIZE		21.0	$\blacksquare$	<del>工</del>	CBR Det. @ 9			
6	\$ 20		Ш				_	DIAI	METERS		10.0 Number of Blows		100.0	% EXPANSIO CONSOLIDAT			
	10	+++				<del>                                     </del>	D 60			-	Number of Blows			CONSOLIDAT	ION		
0   1   1   1   1   1   1   1   1   1								-				1 -1-	M	_			
	0.01 0.1 1 10 D 10												Lab	.Manage	<u>r</u>		
							]										



						Ī							
Client.		USAID				Contractor.	TE	TRA TECH		Jol	b No.	C	GO -21
Project.		Geotechnical Exploration	onn for Salang Tun	nel Substation, Afg	hanistan	Project No.	KS	C-229		Sa	mple Date.	11/	11/2013
Project Loc	ation.	Parvan Province, Sal	ang Tunnel Subs	tation		Submitted to.	TE.	TRA TECH					
Material So	urce.	Bore Hole No # 2				Soil Descoription.	Bou	ulder					
Bore Hole		BH # 2	Witr	essed by.		Contractor Rep.	Sar	npled by.		Sha	awal Lab by Fie	eld Team,	
Depth of ( N	VI)	2.25 m	QTY	. Represented,									
	SIE	VE ANALYSIS (	OF GRANULA	AR SOILS (AS	STM D 4	22 )		TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LIN	IIT OF SOIL	(ASTM D	4318)
A Wt. of [	Dry Sample	Before Washing			g		Α	Container No		4 D	2 D	3 D	4 D
B Wt. of D	Dry Sample	After Washing			g		В	Number of Bumps					
C Wt. of N	Mat'ls Loss I	During Washing (A -	B)		g		С	Mass of Wet Soil and Container	g				
D %tage o	of Mat'ls Pas	ssing 75µm (no. 200)			g		D	Mass of Dry Soil & Container	g				
E Natural	Moisture Co	ontent			%		Е	Mass of Container	g				
Sie	eve Size	Weigth		% of	Whole	NO. OPEQUEIOATION	F	Mass of Moisture (C - D)	g				
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Pass	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
3	76.2	(0)					Н	Moisture Content (F / G) x 100	%				
2 1/2	63								AST	IC LIMIT			•
2	50						Α	Container No		4 D	4 D	Ave	rage
1 1/2	37.5						С	Mass of Wet Soil and Container	g				
1	25						D	Mass of Dry Soil & Container	g				
3/4	19						Е	Mass of Container	g				
1/2	12.5						F	Mass of Moisture (C - D)	g				
3/8	9.5		Boi	ılder			G	Mass of Dry soil (D - E)	g				
1/4	6.3						Н	Moisture Content (F / G) x 100	%				
# 4	4.75						CI	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Boi	ılder
# 10	2.00												
# 40	0.425							No of Blows / Moisture	Con	tent		nary of LL	,PL,PI
# 100	0.150							33.0	+	##	LL @ 25 Blov	VS	
# 200	0.075						8	31.0	$\pm$		Plastic Limit		
100		article Size Distrid	ution Curve	ТПППП		nary of S,Analysis	E	29.0 NONPLAS 25.0 23.0		##	Plasticity Inde		
90		<del>                                      </del>	<del>-                       -  </del>	<del>                 </del>	Gravel	0.0 %	onte	27.0 NON DIAC	-			DENSITY (A	STM D1557)
<b>9</b> 80 70					Sand	3.0 %	Sec	as a state of the	-		OMC %		
is 60	- 1 1 1	<del>                                      </del>	<del>-                                     </del>	<del>                                     </del>	%200 Sie		stri	25.0	#		MDD g/cc		
<b>5</b> 0 50	-		<del>-                                     </del>	<del>                                     </del>	N.Moistu		Mo	23.0				R (ASTM D1	1883)
% Passing Sieve	- 1 1 1		<del>-                                     </del>			PARTICALE SIZE		21.0	_	##	CBR Det. @		
% 20	- 1 1 1				<del> </del>	DIAMETERS	-	10.0 Number of Blows		100.0	% EXPANSION CONSOLIDA		
10			<del>-                                    </del>	<del>                                     </del>	D 60		5	Number of Blows			CONSOLIDA	TION	
(	0 + + +			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	D 30		4				ء ا	h Mana	
	0.01	0.1 1	10		D 10						<u>La</u>	b.Manage	<u> </u>
							•						



Cli	ent.		USAII	D				Co	ntractor.	TE	FRA TECH		Jo	b No.	(	GO -21
Pro	oject.		Geote	chnical Exploratio	nn for Salang Tun	nel Substation, Afç	ghanista	an <b>Pro</b>	ject No.	KS	C-229		Sa	mple Date.	11.	/11/2013
Pro	oject Locat	tion.	Parva	n Province, Sala	ang Tunnel Subs	tation		Sul	bmitted to.	TE	FRA TECH		•		•	
Ма	terial Soul	rce.	Bore I	Hole No # 2				Soi	il Descoription.	Βοι	ılder					
Во	re Hole		BH # :	2	Witr	essed by.		Cor	ntractor Rep.	Sar	npled by.		Sh	awal Lab by Fie	eld Team,	
De	pth of ( M	)	3.00 n	n	QTY	. Represented,										
		SIE	VE A	ANALYSIS O	F GRANULA	AR SOILS (A	STM	D 422)			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LI	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample	Before	e Washing				g		Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After \	Nashing				g		В	Number of Bumps					
С	Wt. of Ma	at'ls Loss	During	ı Washing (A - E	3)			g		С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pa	ssing 7	75µm (no. 200)				g		D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture C	ontent					%		Е	Mass of Container	g				
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	Passing	% I	assing	SI ESII ISATISN	G	Mass of Dry soil (D - E)	g				
	3	76.2	2							Н	Moisture Content (F / G) x 100	%				
	2 1/2	63									PL	AST	IC LIMIT			
	2	50								Α	Container No		4 D	4 D	Ave	erage
	1 1/2	37.5	5							С	Mass of Wet Soil and Container	g				
	1	25								D	Mass of Dry Soil & Container	g				
	3/4	19			Bould	ler				Е	Mass of Container	g				
	1/2	12.5								F	Mass of Moisture (C - D)	g				
	3/8	9.5								G	Mass of Dry soil (D - E)	g				
_	1/4	6.3								Н	Moisture Content (F / G) x 100	%				
-	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Воц	ulder
-	# 10 # 40	2.00 0.42					<del> </del>					2000	2.100	Sumn	l nary of LL	DI DI
	# 100	0.42									33.0 7 No of Blows/Moisture	Con	tent	LL @ 25 Blov		.,ı <b>.</b> ,ı ı
	# 200	0.07								-	310	$\pm$		Plastic Limit	WO	
				e Size Distrid	ution Curve		Su	mmarv	of S,Analysis		31.0			Plasticity Inde	ex	
	100 90			C 512C DISTINCT	I I I I I I I I I I I I I I I I I I I		Grave			tent	29.0 NON PLAS			MOISTURE-		STM D1557)
۱ ,	00		11111			<del>                                     </del>	Sand			Con	27.0 NON PLAS	HE		OMC %		,
3	70				<del>-                                     </del>	<del>                                     </del>		) Sieve		all all	25.0			MDD g/cc		
5	60							isture		oist	23.0				R (ASTM D	1883)
1	<b>2</b> 40		ШШ				Т	HE PAF	RTICALE SIZE	Z		+	##	CBR Det. @	•	
6	70 60 50 40 30 88		++++++++++++++++++++++++++++++++++++	<del>-                                    </del>	<del>-                                     </del>	<del>                                     </del>			METERS		21.0			% EXPANSI		
%	e 20 10						D 60			-	10.0 Number of Blows		100.0	CONSOLIDA	NOITA	
	0						D 30							•		•
		0.01	0.	.1 1	10		D 10							<u>La</u>	b.Manage	<u>er</u>
		J.U1	<u> </u>	.1	10		0 10									



Clie	ent.		USAID				Co	ntractor.	TF	TRA TECH		امل	b No.	(	GO -21
	ject.		Geotechnical Explora	tionn for Salar	na Tunnel Substation	Δfαhanie		oject No.		C-229			mple Date.		/11/2013
$\vdash$	ject Locati		Parvan Province, S			i, Aignanis		bmitted to.	+	TRA TECH		Joa	inple bate.	11/	11/2013
	terial Sour		Bore Hole No # 2	alarig Furrite	CabstatiOH			il Descoription.	-	ulder					
_	re Hole		BH # 2		Witnessed by.			ntractor Rep.	1	mpled by.		Sh	awal Lab by Fie	ald Team	
	oth of (M)		4.50 m		QTY. Represent	ted	- 00	illiactor (Cp.	Oai	npica by.		1011	awai Lab by i ic	ou roam,	
Del	JULI OI ( IVI )		VE ANALYSIS	OF GRAN			D 422			TEST REPORT LIQUID LIMIT AN	n PI	ASTIC LIN	MIT OF SOIL	(ASTM D	4318 )
Α	Wt. of Dry		Before Washing	OI OILAI	IOLAIN GOILG	(ACTIV	g		Α	Container No		4 D	2 D	3 D	4 D
В		<u> </u>	After Washing				g		В	Number of Bumps					<del>                                     </del>
C			During Washing (A	- B)			g		С	Mass of Wet Soil and Container	g				
D			ssing 75µm (no. 20				g		D	Mass of Dry Soil & Container	g				
E	Natural M			- /			%		E	Mass of Container	g				
	Sieve		Weigth		% of	W	hole NO.		F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM(g	) % fo reta			Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		70101010	inioa i accini	, ,	r accing		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63										IC LIMIT		•	
	2	50							Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5							С	Mass of Wet Soil and Container	g				_
	1	25							D	Mass of Dry Soil & Container	g				
	3/4	19							Е	Mass of Container	g				
	1/2	12.5							F	Mass of Moisture (C - D)	g				
	3/8	9.5		R	oulder				G	Mass of Dry soil (D - E)	g				
	1/4	6.3			Juluci				Н	Moisture Content (F / G) x 100	%				
	# 4	4.75							CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	ılder
	# 10	2.00													
	# 40	0.425								No of Blows / Moisture	Con	tent		nary of LL	,PL,PI
<u> </u>	# 100	0.150						+	-				LL @ 25 Blov	WS	
$\vdash$	# 200	0.075		: d 1 :		6.	ımmarı	of C Apolysis		31.0			Plastic Limit		
	100	P	article Size Distr	laution Cur	ve 			of S,Analysis	THE BUT	29.0	+	##	Plasticity Inde		OTM D4557
	90 80		<u> </u>			Gra			ontio	29.0 NONPLASI	Tr		MOISTURE-	א א וופאים א (A	
9	70					San			rec	25.0	-		OMC %	-	10.00
j	60	+++	+++++	$\parallel \parallel $	<del>                </del>		0 Sieve		str	25.0	F		MDD g/cc	R (ASTM D	
ii	50	+++	<del>                                     </del>	<del>                                     </del>	<del>                                     </del>		oisture	I RTICALE SIZE	Mo	23.0	#	##		•	· ·
% Passing Sieve	30 40 30							METERS		21.0	-	Ш,	CBR Det. @		1.1
8		+		$\parallel \parallel $	<del>                                      </del>	D 60		WILIERS		10.0 Number of Blows		100.0	CONSOLIDA		
	10	+++			<del>                 </del>	D 30							CONTOCLIDA		
	0	1		<del>'                                     </del>	<del>'''                                   </del>	D 30	1		1				وا	b.Manage	۲r
	0	0.01	0.1	1	10	D 10	)						<u>La</u>	D. Mai laye	<u>71</u>
Щ									1						



Client.		USAID				Со	ntractor.	TE	TRA TECH		Jol	No.		GO -21
Project.		Geotechnical Explorati	onn for Saland	g Tunnel Substation, Af	ghanist	an <b>Pro</b>	oject No.	KS	C-229			mple Date.	11,	/11/2013
Project Loca	ition.	Parvan Province, Sa					bmitted to.	TE	TRA TECH		<u> </u>			
Material Sou		Bore Hole No # 2				So	il Descoription.	Βοι	ılder					
Bore Hole		BH # 2		Witnessed by.		Co	ntractor Rep.	Sar	npled by.		Sha	awal Lab by Fie	eld Team,	
Depth of ( M	)	6.00 m		QTY. Represented	,						•			
	SIE	VE ANALYSIS	OF GRAN	ULAR SOILS (A	STM	D 422)			TEST REPORT LIQUID LIMIT AN	D PI	ASTIC LIN	IIT OF SOIL	(ASTM D	4318)
A Wt. of D	ry Sample	Before Washing				g		Α	Container No		4 D	2 D	3 D	4 D
B Wt. of D	ry Sample	After Washing				g		В	Number of Bumps					
C Wt. of M	lat'ls Loss I	During Washing (A -	B)			g		С	Mass of Wet Soil and Container	g				
D %tage of	f Mat'ls Pa	ssing 75µm (no. 200)	)			g		D	Mass of Dry Soil & Container	g				
E Natural N	Moisture C	ontent				%		Е	Mass of Container	g				
Siev	e Size	Weigth		% of	Wł	hole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
Inch	mm	Ret CUM(g)	% fo retai	ned Passing	%	Passing	JECIPICATION	G	Mass of Dry soil (D - E)	g				
3	76.2							Н	Moisture Content (F / G) x 100	%				
2 1/2	63								PL	AS7	TIC LIMIT			
2	50							Α	Container No		4 D	4 D	Ave	rage
1 1/2	37.5	;						С	Mass of Wet Soil and Container	g				
1	25							D	Mass of Dry Soil & Container	g				
3/4	19							Е	Mass of Container	g				
1/2	12.5							F	Mass of Moisture (C - D)	g				
3/8	9.5		R	<del>oulder</del>				G	Mass of Dry soil (D - E)	g				
1/4	6.3			Culaci				Н	Moisture Content (F / G) x 100	%				
# 4	4.75				-			CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Воц	ılder
# 10	2.00				<del> </del>		1		272727272			Cumn	L of I I	DI DI
# 40 # 100	0.425 0.150						+		33.0 7 No of Blows / Moisture	Con	tent		nary of LL	,PL,PI
# 100	0.150				+			_		#	##	LL @ 25 Blo	NS	
		article Size Distric	lution Cun	<u> </u>	Su	ımmarv	of S,Analysis		31.0	#	##	Plasticity Ind		
100 90					Grav		, Ci O, Ailaiy 313	ent	29.0 NON PLAS	+			-DENSITY (A	STM D1557)
					Sanc			on	27.0 NON PLAS			OMC %	DENOTT (A	01W D1337)
70	+++	<del>                                      </del>		<del>                                     </del>		0 Sieve		lle (	25.0			MDD g/cc	-+	
<b>is</b> 60		<del>                                      </del>		<del>                                     </del>		oisture		ist.	25.0	$\pm$	##		R (ASTM D1	1883)
50 sins 50 40							RTICALE SIZE	Mo	23.0	#		CBR Det. @	-	1000)
<b>a</b> 30					'		METERS		21.0	_		% EXPANSI		
	+++			<del>                                     </del>	D 60				10.0 Number of Blows		100.0	CONSOLIDA		
10 0					D 30		+ +	1				1		<u> </u>
	•	0.4		1				1				La	b.Manage	er
	0.01	0.1	<u> </u>	10	D 10	· [						<u>~</u>		_
					<del>-!</del>	I	I I	-						



										_						
Clie	ent.		USAID	)				Co	ontractor.	TE	TRA TECH		Jo	b No.	(	GO -21
Pro	ject.		Geotecl	hnical Exploration	nn for Salang T	Tunnel Substation, Af	ghanist	an <b>P</b> r	oject No.	KS	C-229		Sa	mple Date.	11	/11/2013
Pro	ject Locat	tion.	Parvan	Province, Sala	ing Tunnel Si	ubstation		Sı	ıbmitted to.	TE	TRA TECH					
Mat	terial Soul	rce.	Bore H	lole No # 3				Sc	oil Descoription.	Silty	/ Sand with gravel					
Bor	e hole No	)	BH # 3	3	W	/itnessed by.		Co	ontractor Rep.	San	npled by.		Sh	awal Lab by Fie	eld Team,	
Dep	oth of (M)	)	0.75 m	1	Q	TY. Represented,		1 1	Bag Aprox (50 KG)							
		SIE	VE A	NALYSIS O	F GRANU	LAR SOILS (A	STM	D 422	)		TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LI	MIT OF SOIL	(ASTM D	4318)
Α	Wt. of Dr	y Sample	Before	Washing				g	2474.0	Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After W	/ashing				g	1892.1	В	Number of Bumps					
С	Wt. of Ma	at'ls Loss [	During	Washing (A - E	3)			g	581.9	С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	sing 7	5µm (no. 200)				g	23.5	D	Mass of Dry Soil & Container	g				
Е	Natural M	Noisture Co	ontent					%	3.6	Е	Mass of Container	g				
	Sieve	e Size		Weigth		% of	Wh	nole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retaine	ed Passing	%	Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		0	0	100.0		100		Н	Moisture Content (F / G) x 100	%				
	2 1/2	63		0	0	100.0		100			PL	AS7	TIC LIMIT	•		
	2	50		0	0.0	100.0		100		Α	Container No		4 D	4 D	Ave	erage
	1 1/2	37.5		164	6.6	93.4		93		С	Mass of Wet Soil and Container	g				
	1	25		318.2	12.9	87.1		87		D	Mass of Dry Soil & Container	g				
	3/4	19		418.3	16.9	83.1		83		Е	Mass of Container	g				
	1/2	12.5		599.5	24.2	75.8		76		F	Mass of Moisture (C - D)	g				
	3/8	9.5		739.1	29.9	70.1		70		G	Mass of Dry soil (D - E)	g				
	1/4	6.3		825.2	33.4	66.6		67		Н	Moisture Content (F / G) x 100	%				
	# 4	4.75		906.3	36.6	63.4		63		CL	ASSIFICATION OF SOIL ASTM D 2	2487		(SM)	Silty Sand	with gravel
	# 10	2.00		1376.2	55.6	44.4		44		-				, ,		
	# 40	0.425		1680.7	67.9	32.1		32			No of Blows / Moisture	Con	tent		nary of LL	
_	# 100	0.150		1818.9	73.5	26.5	<del> </del>	26		-		$\pm$	##	LL @ 25 Blov	VS	NP
	# 200	0.075		1991.2	80.5	19.5	C	20	r of C Amphysic	8	31.0			Plastic Limit		NP NP
	100	P	article 	Size Distridu	ition Curve				y of S,Analysis	put But	29.0	#	##	Plasticity Inde		NP
	90			<del>-                                     </del>	<u> </u>		Grav		37.0 %	ont	29.0 NON PLAS	FIF		MOISTURE-	DENSITY (A	STM D1557
A	70						Sand		43.0 %	De	25.0			OMC %		
Si	60			<del>-                                     </del>		<del></del>		) Sieve	20.0 %	Stu	25.0			MDD g/cc	A CTM D	4000\
l ii	50			<del>-                                      </del>	<del></del>	<del>-                                     </del>		oisture	3.6 RTICALE SIZE	Mo	25.0	$\pm$	##		R (ASTM D	1883)
% Passing Sieve	40						'		METERS		21.0	-	##	CBR Det. @		
%		+			<del>-                                     </del>	<del></del>	D 60	DIA	IVIETERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDATE		
	10	+++	HM	<del>-                                     </del>	<del>-  -  -  -  -  -  -  -  -  -  -  -  -  -</del>	<del></del>	D 60 D 30		+ +					JOHOGLIDA		
	0	+					ט 30		+ +	ł				ام ا	b.Manage	ar.
	C	0.01	0.3	1 1	10	ס	D 10							<u>∟a</u>	u.iviai iagt	<u> </u>
							<u> </u>			<u> </u>						



Clie	nt.		USAID					Co	ntractor.	TE <sup>-</sup>	TRA TECH		Jok	No.	G	O -21
Pro	ject.		Geotechnical Expl	orationr	n for Salang T	unnel Substation, Af	ghanista	an <b>Pro</b>	oject No.	KS	C-229		Sar	nple Date.	11/	11/2013
Pro	ject Locat	ion.	Parvan Province	, Salan	ng Tunnel Su	bstation		Su	bmitted to.	TE.	ra tech		•		•	
Mat	erial Sour	ce.	Bore Hole No # 3	3				So	il Descoription.	Βοι	lder					
Bor	e hole No.		BH # 3		w	itnessed by.		Со	ntractor Rep.	Sar	npled by.		Sha	awal Lab by Fie	eld Team,	
Dep	th of (M)	)	1.50 m		Q	ΓΥ. Represented,	,									
		SIE	VE ANALYS	IS OF	F GRANUI	LAR SOILS (A	STM	D 422 )			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LIN	IIT OF SOIL	(ASTM D 4	318)
Α	Wt. of Dry	y Sample	Before Washing					g		Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dry	y Sample	After Washing					g		В	Number of Bumps					
С	Wt. of Ma	at'ls Loss [	During Washing	(A - B)	)			g		С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pas	ssing 75µm (no.	200)				g		D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Co	ontent					%		Е	Mass of Container	g				
	Sieve	Size	Weigth	h		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret CUM	1(g)	% fo retaine	d Passing	% I	Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2		Ť						Н	Moisture Content (F / G) x 100	%				
	2 1/2	63									PL	AST	IC LIMIT			
	2	50								Α	Container No		4 D	4 D	Avei	age
	1 1/2	37.5								С	Mass of Wet Soil and Container	g				
	1	25								D	Mass of Dry Soil & Container	g				
	3/4	19			ملييم	4				Е	Mass of Container	g				
	1/2	12.5			<u> Bould</u>	<u>iei</u>				F	Mass of Moisture (C - D)	g				
	3/8	9.5								G	Mass of Dry soil (D - E)	g				
	1/4	6.3								Н	Moisture Content (F / G) x 100	%				
	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	lder
	# 10	2.00									**************************************			Cumn	l nary of LL,	DI DI
	# 40 # 100	0.425					-		+		33.0 7 No of Blows / Moisture	Con	tent	LL @ 25 Blov		PL,PI
	# 100 # 200	0.130								-		#	##	Plastic Limit	VS	
			article Size Dis	etridut	tion Curve		Su	mmarv	of S,Analysis		31.0	$\mp$	#	Plasticity Inde	27	
	100 90					ПППП	Grave		, analysis	ent	29.0 NON PLAST			MOISTURE-		STM D1557
41	00						Sand			Con	27.0 NON PLAS	TC		OMC %	DENOTIT (A	51111 B 1007
ě	70				<del>-                                     </del>	<del>  -     </del>		) Sieve		JIE (	25.0			MDD g/cc		
S	60			╫	<del>                                     </del>	<del>-                                     </del>		isture		St	22.0	+	#		R (ASTM D1	883)
Sin	, 50 40								RTICALE SIZE			Ŧ		CBR Det. @	-	<u> </u>
% Passing Sieve	30	+	<del>                                     </del>			<del>  -     </del>	-		METERS		21.0	-		% EXPANSION		1
%		+++		╫	<del>                                     </del>	<del>-                                     </del>	D 60	<u> </u>			10.0 Number of Blows		100.0	CONSOLIDA		
	10						D 30	-								1
	· ·	. 04	0.4	١			1			1				La	b.Manage	r
	C	0.01	0.1	1	10		D 10									=



Clie	ent.		USAID	)				Co	ntractor.	TE:	ra tech		Jo	b No.	G	O -21
Pro	ject.		Geotec	chnical Exploratio	nn for Salang Tur	nel Substation, Afg	ghanista	an <b>Pro</b>	ject No.	KS	C-229		Sa	mple Date.	11/	11/2013
Pro	ject Locat	tion.	Parvar	n Province, Sala	ang Tunnel Subs	tation		Sul	bmitted to.	TE	TRA TECH					
Ma	terial Soul	rce.	Bore H	Hole No # 3				Soi	il Descoription.	Βοι	ılder					
Boi	re hole No	).	BH # 3	3	Witi	essed by.		Cor	ntractor Rep.	Sar	npled by.		Sh	awal Lab by Fie	eld Team,	
Dep	oth of (M	)	2.25 m	า	QTY	. Represented,										
		SIE	VE A	NALYSIS O	F GRANUL	AR SOILS (A	STM	D 422)			TEST REPORT LIQUID LIMIT AN	D PL	LASTIC LI	MIT OF SOIL	(ASTM D	1318)
Α	Wt. of Dr	y Sample	Before	Washing				g		Α	Container No		4 D	2 D	3 D	4 D
В	Wt. of Dr	y Sample	After V	Vashing				g		В	Number of Bumps					
С	Wt. of Ma	at'ls Loss	During	Washing (A - E	3)			g		С	Mass of Wet Soil and Container	g				
D	%tage of	Mat'ls Pa	ssing 7	75µm (no. 200)				g		D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture C	ontent					%		Е	Mass of Container	g				
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm		Ret CUM(g)	% fo retained	Passing	% I	Passing	S. EON IOATION	G	Mass of Dry soil (D - E)	g				
	3	76.2								Н	Moisture Content (F / G) x 100	%				
	2 1/2	63									PL	.AST	IC LIMIT			
	2	50								Α	Container No		4 D	4 D	Ave	rage
	1 1/2	37.5	i							С	Mass of Wet Soil and Container	g				
	1	25								D	Mass of Dry Soil & Container	g				
	3/4	19			Paula	\~r				Е	Mass of Container	g				
	1/2	12.5	;		Bould	er				F	Mass of Moisture (C - D)	g				
	3/8	9.5								G	Mass of Dry soil (D - E)	g				
	1/4	6.3								Н	Moisture Content (F / G) x 100	%				
	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	lder
	# 10	2.00												Cumn	l nary of LL	DI DI
	# 40 # 100	0.429 0.150				<del> </del>	<del> </del>			1	No of Blows / Moisture	Con	tent	LL @ 25 Blov		,FL,FI
	# 200	0.13					1			_		#	##	Plastic Limit	VS	
-				e Size Distrid	ution Curve	<u>.</u>	Su	mmarv	of S,Analysis		31.0	+	##	Plasticity Inde	2V	
	100					ПППП	Grave		OI O, Allaly 313	ent	29.0 NON PLAS			MOISTURE-		STM D1557)
١,	90 80						Sand			Loc	27.0 NON DI AC			OMC %	DENOIT (A	51W D1337)
٥	70	+		<del>-                                    </del>	<del>-                                     </del>	<del>                                     </del>	-	) Sieve		lire (	25.0			MDD g/cc		
٥	60		<del>                                     </del>	<del>-                                      </del>	<del>-                     -  </del>	<del>                                     </del>		isture		St	25.0	+	##		R (ASTM D1	883)
<u>1</u>	50 40								RTICALE SIZE	Mo	23.0	#		CBR Det. @	•	1
% Paccing Sieve	30					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 "		METERS		21.0	_		% EXPANSI		
8		+++		<del>-                                      </del>	<del>-                                       </del>	<del>                                     </del>	D 60	<u></u>			10.0 Number of Blows		100.0	CONSOLIDA		
	10 0					<del>                                     </del>	D 30							1		1
	· ·	7	<del>-</del> 1	4	4.5	_	_			1				La	b.Manage	r
	(	0.01	0.	1 1	10		D 10							<u>==</u>	<u></u>	<del>-</del>
								ı		-						



Clier	nt.	l	JSAID					С	ontractor.	TE	FRA TECH		Job	No.	G	GO -21
Proj	ect.	G	eotechnic	al Exploration	nn for Salang	Tunnel Substation,	Afghanist	an <b>P</b>	roject No.	KS	C-229		Sar	nple Date.	11/	11/2013
Proje	ect Locat	ion. F	Parvan Pro	ovince, Sala	ng Tunnel S	Substation		S	ubmitted to.	TE	TRA TECH					
Mate	erial Sour	rce. E	Bore Hole	No # 3				S	oil Descoription.	Βοι	ılder					
Bore	hole No	. B	3H # 3		,	Witnessed by.		С	ontractor Rep.	Sar	npled by.		Sha	awal Lab by Field	l Team,	
Dept	th of (M)	) 3	3.00 m			QTY. Represente	ed,									
		SIE	VE ANA	LYSIS O	F GRAN	JLAR SOILS	(ASTM	D 422	)		TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LIN	IIT OF SOIL (	ASTM D	<b>4318</b> )
	Wt. of Dr	y Sample B	Before Wa	shing				g		Α	Container No		A-2	A-3	A-4	
	Wt. of Dr	y Sample A	fter Wash	ning				g		В	Number of Bumps					
	Wt. of Ma	at'Is Loss D	uring Wa	shing (A - B	3)			g		С	Mass of Wet Soil and Container	g				
	%tage of	Mat'ls Pass	sing 75µm	n (no. 200)				g		D	Mass of Dry Soil & Container	g				
Е	Natural M	loisture Cor	ntent					%		Е	Mass of Container	g				
	Sieve	e Size	١	Neigth		% of	W	hole NO	SPECIFICATION	F	Mass of Moisture (C - D)	g				
	Inch	mm	Ret	t CUM(g)	% fo retain	ned Passing	%	Passing		G	Mass of Dry soil (D - E)	g				
	3	76.2								Н	Moisture Content (F / G) x 100	%				
2	2 1/2	63									PL	AST	IC LIMIT			
	2	50								Α	Container No		A-5	A-5	Ave	rage
	1 1/2	37.5								С	Mass of Wet Soil and Container	g				
	1	25								D	Mass of Dry Soil & Container	g				
	3/4	19								Е	Mass of Container	g				
	1/2	12.5			B	ouldei	_			F	Mass of Moisture (C - D)	g				
	3/8	9.5				ouluei				G	Mass of Dry soil (D - E)	g				
	1/4	6.3								Н	Moisture Content (F / G) x 100	%				
	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	2487		Boulder	Bou	lder
_	# 10	2.00												Comme	mr of II	DI DI
	# 40	0.425 0.150									33.0 7 No of Blows / Moisture	Cont	ent	LL @ 25 Blows	ry of LL	,PL,PI
	# 100 # 200	0.150								_		$\equiv$	#			
ħ			utiala Ci-	na Diatrial	tion Com		S.	ımmar	y of S,Analysis		31.0	$\equiv$	#	Plastic Limit Plasticity Index		
	100	Pa			ution Curv		Grav		y or S,Ariarysis	ent	29.0 NON PLAS		#	MOISTURE-D		CTM D4EE7)
	90 80						Sand			ont	27.0 NON PLAS	HC		OMC %	ENSITI (A	31W D1337)
eve	70	+	<del>                                      </del>		<del>-                                     </del>			0 Sieve		rec	25.0					
% Passing Sieve	60		<del>        </del>		<del>-                                     </del>	<del>                                     </del>	<b>-</b>	oisture		Stu	25.0			MDD g/cc	(ASTM D1	1002)
sing	50		<del>                                      </del>		<del>-                                     </del>	<del>                                     </del>			RTICALE SIZE	Mo	23.0	$\pm$	#		-	1003)
as	40 30						'		AMETERS		21.0	$\perp$	#	CBR Det. @ 95		
1%	20	+			<del>-                                     </del>	<del>                                     </del>	D 60		AMICTERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDAT		
	10	+++	╫╫	<del>-                                     </del>	<del>-                                     </del>	<del>                                     </del>	D 30							CONCOLIDAN	1011	
	0	+	<del>''''                                  </del>			4	D 30	1		1				Lah	.Manage	\r
	C	0.01	0.1	1	1	10	D 10							Lab	iviariaye	<u> </u>
										<u> </u>						



Clien	t.		USAID						Co	ontractor.	TE	FRA TECH		Jok	No.		GO -21
Proje	ect.		Geotech	nical Exploratio	nn for Salan	g Tunne	el Substation, Afg	ghanist	an <b>Pr</b>	oject No.	KS	C-229		Sar	nple Date.	11,	/11/2013
	ct Locat	ion.		Province, Sala						bmitted to.	TE	FRA TECH			•	<u>.</u>	
	rial Sour			ole No # 3					So	il Descoription.	Βοι	ılder					
Bore	hole No.	-	BH # 3			Witne	essed by.		Co	entractor Rep.	Sar	npled by.		Sha	awal Lab by Fie	eld Team,	
Depti	h of (M)	)	4.50 m			QTY.	Represented,							•			
		SIE	VE A	NALYSIS O	F GRAN	ULA	R SOILS (A	STM	D 422	)		TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LIN	IIT OF SOIL	(ASTM D	4318)
Α ۱	Nt. of Dr	y Sample	Before \	Nashing					g		Α	Container No		A-11	A-12	A-13	
В۱	Nt. of Dr	y Sample	After W	ashing					g		В	Number of Bumps					
C \	Nt. of Ma	at'Is Loss I	During V	Vashing (A - E	3)				g		С	Mass of Wet Soil and Container	g				
D 9	%tage of	Mat'ls Pas	ssing 75	μm (no. 200)					g		D	Mass of Dry Soil & Container	g				
E I	Natural M	loisture Co	ontent						%		Е	Mass of Container	g				
	Sieve	Size		Weigth			% of	Wł	nole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
I	nch	mm		Ret CUM(g)	% fo retai	ined	Passing	%	Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2									Н	Moisture Content (F / G) x 100	%				
2	1/2	63										PL	AS7	TIC LIMIT			•
	2	50									Α	Container No		A-14		Ave	rage
1	1/2	37.5									С	Mass of Wet Soil and Container	g				
	1	25									D	Mass of Dry Soil & Container	g				
	3/4	19									Е	Mass of Container	g				
	1/2	12.5			D		ılder				F	Mass of Moisture (C - D)	g				
	3/8	9.5			D	V	lluei				G	Mass of Dry soil (D - E)	g				
	1/4	6.3									Н	Moisture Content (F / G) x 100	%				
	# 4	4.75									CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	ılder
	<sup>‡</sup> 10	2.00									_						
	<sup>‡</sup> 40	0.425										33.0 7 No of Blows / Moisture	Con	tent		nary of LL	,PL,PI
	100	0.150						-					$\pm$	##	LL @ 25 Blov	VS	
#	200	0.075			<u></u>			C		r of C Amelyois	8	31.0		##	Plastic Limit		
	100	P	<u>article</u> 	Size Distridu	ution Curv		ПППП			of S,Analysis	FILE	29.0	#	##	Plasticity Inde		OTM D4557
	90 80			<del>                                     </del>	11111		<del></del>	Grav			out	29.0 NON PLAS	11		MOISTURE-	DENSITY (A	STM D1557
% Passing Sieve	70							Sand			Se	25.0			OMC %		
Sie	60			<del>-                                     </del>	<del>-                    </del>	╫	<del></del>		0 Sieve		SEL	25.0			MDD g/cc	) (A OTM D	1000)
ing	50		╁┼┼┼┼┼	<del>-                                     </del>	<del>-              </del>	$\parallel$	<del></del>		oisture	 RTICALE SIZE	Mo	25.0	$\pm$	##		R (ASTM D	1883)
ase	40 30							'		METERS		21.0	+		CBR Det. @		
%	20	+			+++++	$\Vdash$		D 60		WIETERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDA		
	10	+++	╁┼┼┼┼┼┼	<del>-  -  -  -  -  -  -  -  -  -  -  -  -  -</del>	<del>-              </del>	$H \rightarrow$	<del>-                                     </del>	D 60 D 30		+ +					JOHOOLIDA		1
	0	+				<del>''                                    </del>	<u></u>		•		-				la	b.Manage	ar ar
	C	0.01	0.1	1		10		D 10							<u>La</u>	o.iviariage	<u>//</u>
								1			<u> </u>						



Client		ι	JSAID						Co	ontractor.	TE:	FRA TECH		Jok	No.	(	GO -21
Projec	ct.	G	Seotechnical I	Exploration	nn for Salang	Tunne	el Substation, Af	ghanist	an <b>Pr</b>	oject No.	KS	C-229		Sar	nple Date.	11/	/11/2013
	ct Locatio		Parvan Provi	-						bmitted to.	TE	FRA TECH			•		
	ial Source		Bore Hole No						Sc	il Descoription.	Βοι	ılder					
Bore I	hole No.	Е	3H # 3			Witne	ssed by.		Co	entractor Rep.	Sar	npled by.		Sha	awal Lab by Fie	eld Team,	
Depth	of (M)	6	6.00 m			QTY.	Represented,	ı						•			
		SIE	VE ANAL	YSIS O	F GRAN	ULAF	R SOILS (A	STM	D 422	)		TEST REPORT LIQUID LIMIT AN	D PI	LASTIC LIN	IIT OF SOIL	(ASTM D	4318)
A V	t. of Dry S	Sample E	Before Wash	ning					g		Α	Container No		A-11	A-12	A-13	
в и	t. of Dry S	Sample A	After Washin	ng					g		В	Number of Bumps					
C V	t. of Mat'ls	s Loss D	uring Wash	ing (A - E	3)				g		С	Mass of Wet Soil and Container	g				
D %	stage of Ma	at'ls Pas	sing 75µm (ı	no. 200)					g		D	Mass of Dry Soil & Container	g				
E N	latural Mois	sture Co	ntent						%		Е	Mass of Container	g				
	Sieve S	Size	We	eigth			% of	Wł	nole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g				
In	nch	mm	Ret C	CUM(g)	% fo retai	ned	Passing	%	Passing	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
	3	76.2									Н	Moisture Content (F / G) x 100	%				
2	1/2	63										PL	AS7	TIC LIMIT			
	2	50									Α	Container No		A-14		Ave	erage
1	1/2	37.5									С	Mass of Wet Soil and Container	g				
	1	25									D	Mass of Dry Soil & Container	g				
3	3/4	19									Е	Mass of Container	g				
1	/2	12.5			D.	<u> </u>	<del>lder</del>				F	Mass of Moisture (C - D)	g			<u> </u>	
_	3/8	9.5			D	vu	luci				G	Mass of Dry soil (D - E)	g				
	/4	6.3									Н	Moisture Content (F / G) x 100	%				
	4	4.75									CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Вог	ulder
	10	2.00															DI DI
	40	0.425									-	33.0 7 No of Blows / Moisture	Con	tent		nary of LL	,PL,PI
	100 200	0.150 0.075												##	LL @ 25 Blov Plastic Limit	VS	
# .			tiala Ciaa	District	ution Com			S.	mmarı	of S,Analysis		31.0	#	##			
	100 —	Pa	rticle Size	Distriat	ution Curv		ТППП	Grav		/ OI 3,Allalysis	ent	29.0 NON PLAS	#	##	Plasticity Inde		CTM D4EE7
۵.	90 80							Sand			ont	27.0 NON DIACT	H		OMC %	DENSIT (A	STW DISSI
eve	70					$\parallel \perp \parallel$	<del>-                                     </del>	-	) Sieve		rec	25.0			MDD g/cc	<del></del>	
Si	60 +			<del>                                     </del>		+	<del>- - -     </del>		oisture		Stu	25.0	+	##		R (ASTM D1	1002\
sing	50 <del>-</del> 40 -						<del>                                     </del>			RTICALE SIZE	Mo	23.0	#	##	CBR Det. @	-	1003)
% Passing Sieve	30									METERS		21.0		ш,	% EXPANSI		
%	20 -						<del>- - -     </del>	D 60		I		10.0 Number of Blows		100.0	CONSOLIDA		
	10 +	+	╫		<del>-                </del>	$\parallel - \parallel$	<del>                                     </del>	D 30		<del>-   -  </del>							
	0 +					<del>'</del>				<del>-   -  </del>	1				la	b.Manage	er.
	0.0	)1	0.1	1		10		D 10							<u>a</u>	<u>J. IVIGITAGE</u>	<u> </u>
								-			<del></del>						



Client.		USAID				Contractor.	TE	TRA TECH		Jo	b No.		GO -21
Project.	•	Geotechnical Explora	ationn for Salang	Tunnel Substation, Afg	hanistan	Project No.	KS	C-229		Sa	ample Date.	11	/11/2013
Project	Location.	Parvan Province, S	Salang Tunnel S	ubstation		Submitted to.	TE	TRA TECH					
Materia	l Source.	Bore Hole No # 6				Soil Descoription.	Silty	/ Sand with gravel					
Bore Ho	ole No.	BH # 6	V	Vitnessed by.		Contractor Rep.	Sar	npled by.		Sh	nawal Lab by Fie	eld Team,	
Depth o		0.75 m		QTY. Represented,		1 Bag Aprox (50 KG)		-					
	SI	EVE ANALYSIS	OF GRANU	JLAR SOILS (AS	STM D	122 )		TEST REPORT LIQUID LIMIT AN	ND PI	LASTIC LI	MIT OF SOIL	(ASTM D	4318)
A Wt.	. of Dry Sample	e Before Washing			g	3220.0	Α	Container No		A-3	A-4	A-5	
-		After Washing			g	2035.0	В	Number of Bumps					
		During Washing (A			g	1185.0	С	Mass of Wet Soil and Container	g				
D %ta	age of Mat'ls Pa	assing 75µm (no. 20	00)		g		D	Mass of Dry Soil & Container	g				
E Nat	tural Moisture C	Content			%	3.2	Е	Mass of Container	g				
	Sieve Size	Weigth		% of	Whole	NO. SPECIFICATIO	N F	Mass of Moisture (C - D)	g				
Inch	h mn	n Ret CUM(g	y) % fo retain	ed Passing	% Pas		G	Mass of Dry soil (D - E)	g				
3	76.	2 0	0	100.0	10	0	Н	Moisture Content (F / G) x 100	%				
2 1/2	2 63	0	0	100.0	10	0		PI	LAS7	TIC LIMIT			
2	50	201	6.2	93.8	94		А	Container No		A-3		Av	erage
1 1/2	2 37.	5 508	15.8	84.2	84		С	Mass of Wet Soil and Container	g				
1			16.3	83.7	84		D	Mass of Dry Soil & Container	g				
3/4			17.3	82.7	83		Е	Mass of Container	g				
1/2			18.0	82.0	82		F	Mass of Moisture (C - D)	g				
3/8			18.6	81.4	81		G	Mass of Dry soil (D - E)	g				
1/4			19.1	80.9	81		Н	Moisture Content (F / G) x 100	%				
# 4			21.6	78.4	78		CL	ASSIFICATION OF SOIL ASTM D	2487		(SM)	Silty Sand	d with gravel
# 10			32.4	67.6	68							oom, of li	ם פי
# 40			49.8	50.2	50			33.0 3	Con	tent		nary of LI	
# 10			58.2	41.8 37.2	42 37		_		=	##	LL @ 25 Blov	WS	NP NP
			62.8			l nary of S,Analysis	8	31.0	=	##	Plastic Limit	27	NP NP
	100	Particle Size Distr					ent e	29.0		##	Plasticity Ind		
	90				Gravel	22.0 %	- To	29.0 NON PLAS	TIF			יטבאטוו <i>ו</i> (א	ASTM D1557
% Passing Sieve	70				Sand	41.0 %	De C	25.0			OMC %	+	
S	60			<del>                                     </del>	%200 Si		str	25.0		H	MDD g/cc	O /ACTAI D	1002)
Sing	50			<del>                                     </del>	N.Moistu	re 3.2 PARTICALE SIZE	Mo	23.0	=	##		R (ASTM D	1003)
Pas	40					DIAMETERS		21.0	_		CBR Det. @		
%	20			<del>                                     </del>	D 60	DIAIVIL I ENS	2.0	10.0 Number of Blows		100.0	CONSOLIDA	-	
	10	<del>                                     </del>		<del>                                     </del>	D 30	+ +					TOO! TOOLIDA		
	0 +	<del></del>	• • • • • • • • • • • • • • • • • • • •	<del>                                     </del>	ט 30	+ +	$\dashv$				١.	b.Manag	or
	0.01	0.1	1 1	0	D 10						<u>La</u>	<u>v.iviariag</u>	<u>U</u>
					<u> </u>								



Client			USAI	D								Con	tractor.	TET	RA TECH		J	lob No.		GO -21
Projec	t.		Geote	chnical Ex	ploratio	nn for Sala	ang Tuni	nel Su	ubstation	n, Afghar	istan	Proj	ect No.	KS	C-229		s	Sample Date.		11/11/2013
Projec	t Locat	ion.			-	ang Tunne							mitted to.	TET	RA TECH			·	<u></u>	
Materi	al Sour	rce.	Bore	Hole No #	<del>#</del> 6							Soil	Descoription.	Bou	der					
Bore H	lole No		BH#	6			Witn	nesse	ed by.			Con	tractor Rep.	San	pled by.		S	Shawal Lab by Fi	eld Team,	
Depth	of (M)	)	1.50 ו	m			QTY	′. Rep	present	ted,							•	-		
		SIE	EVE	ANALY	SIS O	F GRA	NULA	AR S	OILS	(AST	M D 42	22)			TEST REPORT LIQUID LIMIT AN	ID PI	LASTIC L	IMIT OF SOIL	(ASTM	O 4318 )
A W	t. of Dr	y Sample	Befor	e Washin	ıg						g			Α	Container No		S-1	S-2	S-3	
B W	t. of Dr	y Sample	After	Washing							g			В	Number of Bumps					
C W	t. of Ma	at'ls Loss	Durino	g Washin	g (A - E	3)					g			С	Mass of Wet Soil and Container	g				
D %	tage of	Mat'ls Pa	ssing	75µm (no	. 200)						g			D	Mass of Dry Soil & Container	g				
E N	atural M	loisture C	ontent								%			Е	Mass of Container	g				
	Sieve	Size		Weig	gth				% of	١	N hole N	IO.	CDECIFICATION	F	Mass of Moisture (C - D)	g				
In	ch	mm		Ret CU	JM(g)	% fo ret	tained	ı	Passing	<b>a</b>	% Passi	ng	SPECIFICATION	G	Mass of Dry soil (D - E)	g				
;	3	76.2	2		νο,							Ŭ		Н	Moisture Content (F / G) x 100	%				
2 '	1/2	63													Pl	.AS1	TIC LIMIT	Γ	•	
	2	50												Α	Container No		S-6		A	verage
1 '	1/2	37.5	5											С	Mass of Wet Soil and Container	g				
	1	25												D	Mass of Dry Soil & Container	g				
3	/4	19												Е	Mass of Container	g				
1.	/2	12.5	5											F	Mass of Moisture (C - D)	g				
3	/8	9.5				_B(	u	d	<u>er</u>					G	Mass of Dry soil (D - E)	g				
1.	/4	6.3												Н	Moisture Content (F / G) x 100	%				
#	4	4.75	5											CL	ASSIFICATION OF SOIL ASTM D	2487		Boulder	l E	oulder
	10	2.00																		
	40	0.42	_												No of Blows / Moisture	Con	tent		nary of L	
	100	0.15														+	##	LL @ 25 Blo	WS	NP
# 2	200	0.07								-			(0.4.1.1	(%)	31.0			Plastic Limit		NP
	100	P	Partic		<u>                                       </u>	ution Cu	rve 	т п	пπп			ary	of S,Analysis			$\pm$	##	Plasticity Ind		NP
	90	<del>                                      </del>	+++++		++++++		╫	+++			avel			orte	29.0 NON PLAS				-DENSITY	(ASTM D1557
, ve	80 70							Ш	Щ		nd			O a	NUNFLAS	-	##	OMC %		
Sie	60	+				-		+++	Щ		200 Siev			stur	25.0		##	MDD g/cc		
ing	50	+++	+++++			-	HH-	+++	<del>//////</del>		Moisture			Moi	23.0				R (ASTM	1 -
ass	40		11111	-	11111	-		+++	<del>                                      </del>				TICALE SIZE		21.0	+	##	CBR Det. @		)
% Passing Sieve	30 20							Ш	Щ	<u> </u>		ΙΑΝ	IETERS	ł	10.0 Number of Blows		100.0	% EXPANSI		
	10	+++	<del>             </del>	$\square$		++++		+++	<del>/     </del>	D	_		-		Number of Blows			CONSOLIDA	ATION	
	0	+	шш	+	шЩ		Щ	1 11	ЩЩ	D	30									
	C	0.01	0	.1	1		10			D	10							<u>La</u>	b.Mana	<u>ger</u>
														<u> </u>						



Clie	ent.		USAID					Co	Contractor.		TETRA TECH			b No.	(	O -21	
Pro	ject.		Geotech	nical Exploration	nn for Salang Tunr	nel Substation, Afg	hanistar	n <b>Pro</b>	ject No.	KS	C-229		Sa	mple Date.	11,	/11/2013	
Pro	ject Locat	tion.	Parvan	Province, Sala	ing Tunnel Subs	tation		Sul	bmitted to.	TE	RA TECH		•				
Ma	terial Soul	rce.	Bore Ho	ole No # 6				Soi	I Descoription.	Boulder							
Boi	e Hole No	).	BH # 6		Witn	essed by.		Cor	ntractor Rep.	Sar	Sampled by. Shawal Lab by Field Team,						
Dep	oth of (M)	)	2.25 m		QTY	. Represented,											
		SIE	VE AN	NALYSIS O	F GRANULA	R SOILS (AS	STM C	422)			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LIN	IIT OF SOIL	(ASTM D	4318)	
Α	Wt. of Dr	y Sample	Before V	Nashing				g		Α	Container No		B-3	B-4	B-5		
В	Wt. of Dr	y Sample	After W	ashing				g		В	Number of Bumps						
С	Wt. of Ma	at'Is Loss I	During V	Vashing (A - B	3)			g		С	Mass of Wet Soil and Container	g					
D	%tage of	Mat'ls Pas	ssing 75	μm (no. 200)				g		D	Mass of Dry Soil & Container	g					
Е	Natural M	loisture C	ontent				9	%		Е	Mass of Container	g					
	Sieve	e Size		Weigth		% of	Who	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g					
	Inch	mm	ı	Ret CUM(g)	% fo retained	Passing	% P	assing	S. ESII ISATISN	G	Mass of Dry soil (D - E)	g					
	3	76.2								Н	Moisture Content (F / G) x 100	%					
	2 1/2	63									PL	AST	IC LIMIT				
	2	50								Α	Container No		B-3		Ave	rage	
	1 1/2	37.5	;							С	Mass of Wet Soil and Container	g					
	1	25								D	Mass of Dry Soil & Container	g					
	3/4	19								Е	Mass of Container	g					
	1/2	12.5			Во	oulder	•			F	Mass of Moisture (C - D)	g					
	3/8	9.5								G	Mass of Dry soil (D - E)	g		1			
	1/4	6.3								Н	Moisture Content (F / G) x 100	%					
	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Воц	ılder	
	# 10	2.00												0		DI DI	
	# 40	0.425									No of Blows / Moisture	Con	tent		nary of LL		
	# 100 # 200	0.150 0.075								4			##	LL @ 25 Blov Plastic Limit	vs	NP NP	
				Ci-a Diatuid.	.t: C		Sun	nmarv	of S,Analysis		31.0	#		Plasticity Inde		NP	
	100		articie 	Size Distridu	Tion Curve	ТПППП	Grave		UI 3, Allalysis	ent	29.0 NON PLAS	+	#	MOISTURE-			
	90 80									ont	27.0 NON DI ACT	H			DENSITY (A	STW D1557)	
١	70						Sand	0:		Sec	25.0			OMC %			
ij	60	+++		<del>-  -  -  -  -  -  -  -  -  -  -  -  -  -</del>		<del>                                     </del>	%200			stri	25.0			MDD g/cc	A CTM D	1000)	
يَّ. ا	50		<del>                                      </del>	<del>-                                     </del>	<del>-  -  -  -  -  -  -  -  -  -  -  -  -  -</del>	<del>                   </del>	N.Mois		TICALE CIZE	Mo	23.0		##		R (ASTM D	1883)	
% Passing Sieve	40 30						15		RTICALE SIZE		21.0	_	Ш,	CBR Det. @			
%	20	+				<del>                                     </del>	D 00	DIAN	METERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDA			
	10	+++		<del>-  -  -  -  -  -  -  -  -  -  -  -  -  -</del>	<del>-                         -     -  </del>	<del>                                     </del>	D 60			_				CONSOLIDA	NI ION		
	0	+	111111			<u> </u>	D 30			ł				١٥	h Manaa	\r	
	0.01 0.1 1 10 D 10								<u>La</u>	b.Manage	<u> </u>						
										<u> </u>							



Clie	ent.		USAID					Co	Contractor.		TETRA TECH			b No.		GO -21	
Pro	ject.		Geotechr	nical Exploration	nn for Salang Tunr	nel Substation, Afg	ghanista	an <b>Pro</b>	ject No.	KS	C-229		Sa	mple Date.	11/	11/2013	
Pro	ject Locat	tion.	Parvan F	Province, Sala	ang Tunnel Subs	tation		Sul	bmitted to.	TE	RA TECH						
Ma	erial Sou	rce.	Bore Ho	le No#6				Soi	I Descoription.	Boulder							
Boi	e Hole No	).	BH # 6		Witn	essed by.		Cor	ntractor Rep.	Sar	Sampled by. Shawal Lab by Field Team,						
Dep	th of (M	)	3.00 m		QTY	. Represented,											
		SIE	VE AN	IALYSIS O	F GRANULA	R SOILS (A	STM	D 422)			TEST REPORT LIQUID LIMIT AN	D PL	ASTIC LIN	IIT OF SOIL	(ASTM D	4318)	
Α	Wt. of Dr	y Sample	Before V	Vashing				g		Α	Container No		D-1	D-2	D-3		
В	Wt. of Dr	y Sample	After Wa	ashing				g		В	Number of Bumps						
С	Wt. of Ma	at'ls Loss I	During W	/ashing (A - E	3)			g		С	Mass of Wet Soil and Container	g					
D	%tage of	Mat'ls Pas	ssing 75	um (no. 200)				g		D	Mass of Dry Soil & Container	g					
Е	Natural M	loisture C	ontent					%		Е	Mass of Container	g					
	Sieve	e Size		Weigth		% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g					
	Inch	mm	F	Ret CUM(g)	% fo retained	Passing	% F	Passing	JOI ECIFICATION	G	Mass of Dry soil (D - E)	g					
	3	76.2								Н	Moisture Content (F / G) x 100	%					
	2 1/2	63									PL	AST	IC LIMIT				
	2	50								Α	Container No		D-4		Ave	rage	
	1 1/2	37.5								С	Mass of Wet Soil and Container	g					
	1	25								D	Mass of Dry Soil & Container	g					
	3/4	19			- Dan	الماميد				Е	Mass of Container	g					
	1/2	12.5			Bou	luer				F	Mass of Moisture (C - D)	g					
	3/8	9.5								G	Mass of Dry soil (D - E)	g		1			
	1/4	6.3								Н	Moisture Content (F / G) x 100	%					
	# 4	4.75								CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Воц	ılder	
	# 10	2.00												Commen		DI DI	
	# 40	0.425					1				No of Blows / Moisture	Con	tent		nary of LL		
-	# 100 # 200	0.150 0.075								4			##	LL @ 25 Blov Plastic Limit	VS	NP NP	
-				Cina Diatuid.	itian Cimia		Su	mmarv	of S,Analysis		31.0	#	#	Plasticity Inde		NP	
	100			Size Distridu		ПППП	Grave		UI 3, Allalysis	ent	29.0 NON PLAS	+	#	MOISTURE-			
	90						Sand			ont	27.0 NON DIACT	HC		OMC %	DENSIIT (A	31W D1337)	
	70	+++		<del>-                                     </del>		<del>                                     </del>		) Sieve		rec	25.0						
% Paccing Sieve	60	+++				<del>                                     </del>	<b>—</b>			str	25.0			MDD g/cc	R (ASTM D1	1003)	
Ĭ.	50	+++	╁┼┼┼┼┼	<del>                                     </del>	<del>-                                     </del>	<del>                                     </del>		isture	RTICALE SIZE	Mo	23.0	#	##		•	1003)	
986	40						"		METERS		21.0	_	Ш,	CBR Det. @			
8	20	+++		<del>-  -  -  -  -  -  -  -  -  -  -  -  -  -</del>	<del>-                                     </del>	<del>                                     </del>	D 60	DIA	WIETERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDA			
	10	+++	<del>                  -  </del>	<del>-                                     </del>	<del>-                       -  </del>		D 30		+ +					JOHOGEIDA		1	
	0	+	• • • • • • • • • • • • • • • • • • • •			<u> </u>	D 30		+ +	1				La	b.Manage	\r	
	0.01 0.1 1 10 0.10									<u>La</u>	o.iviariaye	<u>il</u>					
Щ								<u> </u>		<u> </u>							



Cli	ent.		USAID						Со	ntractor.	TE	FRA TECH		Jok	No.	<b>No.</b> GO -21		
Pro	oject.		Geotech	nical Exploration	nn for Salan	g Tunn	nel Substation, Afg	hanista	n <b>Pro</b>	ject No.	KS	C-229		Sar	mple Date.	11/	11/2013	
Pro	oject Locat	ion.	Parvan	Province, Sala	ang Tunnel	Subst	tation		Su	bmitted to.	TE.	FRA TECH		•		•		
Ма	terial Sour	rce.	Bore Ho	ole No # 6					Soi	il Descoription.	iption. Boulder							
Во	re Hole No		BH # 6			Witne	essed by.		Coi	ntractor Rep.	Sampled by. Shawal Lab by Field Team,							
De	pth of (M)	)	4.50 m			QTY.	. Represented,											
		SIE	VE A	NALYSIS O	F GRAN	ULA	R SOILS (AS	I MT	) 422 <u>)</u>			TEST REPORT LIQUID LIMIT ANI	D PL	ASTIC LIN	IIT OF SOIL	(ASTM D	<del>1</del> 318 )	
Α	Wt. of Dr	y Sample	Before \	Washing					g		Α	Container No		M-4	M-5	M-6		
В	Wt. of Dr	t. of Dry Sample After Washing g		g		В	Number of Bumps											
С	Wt. of Ma	at'ls Loss	During \	Nashing (A - E	3)				g		С	Mass of Wet Soil and Container	g					
D	%tage of	Mat'ls Pa	ssing 75	iμm (no. 200)					g		D	Mass of Dry Soil & Container	g					
Е	Natural M	loisture C	ontent						%		Е	Mass of Container	g					
	Sieve	Size		Weigth			% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g					
	Inch	mm		Ret CUM(g)	% fo retai	ined	Passing	% F	assing	SPECIFICATION	G	Mass of Dry soil (D - E)	g					
	3	76.2		.=/			-		<u> </u>		Н	Moisture Content (F / G) x 100	%					
	2 1/2	63										PL	AST	IC LIMIT				
	2	50									Α	Container No		M-7		Ave	rage	
	1 1/2	37.5	1								С	Mass of Wet Soil and Container	g					
	1	25									D	Mass of Dry Soil & Container	g					
	3/4	19									Е	Mass of Container	g					
	1/2	12.5	,		Bo	<b>11</b>	lor				F	Mass of Moisture (C - D)	g					
<u> </u>	3/8	9.5			DO	ИП	<u> </u>				G	Mass of Dry soil (D - E)	g					
	1/4	6.3									Н	Moisture Content (F / G) x 100	%					
	# 4	4.75									CL	ASSIFICATION OF SOIL ASTM D 2	487		Boulder	Bou	lder	
	# 10	2.00													Comme	an af I I	DI DI	
	# 40	0.42										33.0 7 No of Blows / Moisture	Con	tent	LL @ 25 Blov	nary of LL		
	# 100 # 200	0.150									_		#	##	Plastic Limit	VS	NP NP	
				Size Distridu	ution Cum	· · ·		Sui	mmarv	of S,Analysis		31.0	#	##	Plasticity Inde	av.	NP	
	100					/e 	ППППП	Grave		UI O, Allalysis	ent	29.0 NON PLAST	Ŧ		MOISTURE-			
	90 80							Sand	1		ont	27.0 NON PLAST	T		OMC %	DENSIT (A	31W D1337	
	70	+				$\parallel \parallel \parallel$	<del>                                     </del>		Sieve		Ire	25.0			MDD g/cc			
Ü	60	+++	╁┼┼┼┼┼┼	<del>-                                     </del>	<del>-                                     </del>	H	<del>                                     </del>	N.Moi			Stu	25.0	+			R (ASTM D1	883/	
2	50 40			<del>- - - - - - -</del>						RTICALE SIZE	Mo	23.0	#	##	CBR Det. @		1003)	
6	80 70 60 50 40 30 20									METERS		21.0	_		% EXPANSION			
8		+++		<del>-  -  -  -  -  -  -  -  -  -  -  -  -  -</del>	++++++++++++++++++++++++++++++++++++	-	<del>                                     </del>	D 60		TI I		10.0 Number of Blows		100.0	CONSOLIDA			
	10 0							D 30							1	-	1	
	O					<del> </del>					1				اء ا	b.Manage	er	
0.01 0.1 1 10 0 10									<u></u>	anage	<u> </u>							
											Ь—							



Cli	ent.		USAID						Со	ntractor.	TE	FRA TECH		Job	No.	No. GO -21		
Pro	oject.		Geotechnica	al Exploration	nn for Salan	g Tunne	el Substation, Afg	hanista	n <b>Pro</b>	ject No.	KS	C-229		Sar	nple Date.	11/	11/2013	
Pro	ject Locat	ion.	Parvan Pro	ovince, Sala	ang Tunnel	Substa	ation		Su	bmitted to.	TE	ra tech		•		•		
Ма	terial Sour	rce.	Bore Hole I	No # 6					So	il Descoription.	ion. Boulder							
Во	re Hole No		BH # 6			Witne	essed by.		Co	ntractor Rep.	Sar	Sampled by. Shawal Lab by Field Team,						
De	pth of ( M )	)	6.00 m			QTY.	Represented,											
		SIE	VE ANA	LYSIS O	F GRAN	ULA	R SOILS (AS	TM [	O 422 )			TEST REPORT LIQUID LIMIT ANI	) PL	ASTIC LIN	IIT OF SOIL	(ASTM D 4	318)	
Α	Wt. of Dr	y Sample	Before Was	shing					g		Α	Container No		4 D	2 D	3 D	4 D	
В	Wt. of Dr	Wt. of Dry Sample After Washing g		g		В	Number of Bumps											
С	Wt. of Ma	at'Is Loss I	During Was	shing (A - E	3)				g		С	Mass of Wet Soil and Container	g					
D	%tage of	Mat'ls Pa	ssing 75µm	n (no. 200)					g		D	Mass of Dry Soil & Container	g					
Ε	Natural M	loisture C	ontent					•	%		Е	Mass of Container	g					
	Sieve	Size	V	Veigth			% of	Wh	ole NO.	SPECIFICATION	F	Mass of Moisture (C - D)	g					
	Inch	mm	Ret	CUM(g)	% fo retai	ned	Passing	% F	assing	SPECIFICATION	G	Mass of Dry soil (D - E)	g					
<u> </u>	3	76.2		(0)			<u> </u>				Н	Moisture Content (F / G) x 100	%					
	2 1/2	63										PL	AST	IC LIMIT		•	•	
	2	50									Α	Container No		4 D	4 D	Avei	age	
	1 1/2	37.5	1								С	Mass of Wet Soil and Container	g					
	1	25									D	Mass of Dry Soil & Container	g					
	3/4	19									Е	Mass of Container	g					
	1/2	12.5	;		Bou	de	er				F	Mass of Moisture (C - D)	g					
	3/8	9.5									G	Mass of Dry soil (D - E)	g					
	1/4	6.3									Н	Moisture Content (F / G) x 100	%	•				
	# 4	4.75									CL	ASSIFICATION OF SOIL ASTM D 24	487		Boulder	Bou	lder	
	# 10	2.00															D. D.	
	# 40	0.42										No of Blows / Moisture (	cont	tent		nary of LL,	•	
	# 100	0.150											$\pm$	#	LL @ 25 Blov	VS	NP	
	# 200	0.075		5:				C		of S,Analysis	(%)	31.0	#		Plastic Limit		NP NP	
	100	P	articie Siz	e Distrial	ution Curv	/e 	ПППП			OI S,AIIaiySiS	ent	29.0 NON PLAST	ŧ		Plasticity Inde		NP	
_	90 80							Grave	9		ont	27.0 NON PLAST	T			DENSITY (AS	וווס ווווס ווווס	
9	70							Sand	0:		Del	25.0	*		OMC %			
Ċ	60	+	+++++++	<del>-                                     </del>	<del>-                                     </del>		<del></del>		Sieve		stu	25.0	F		MDD g/cc	A CTM D4	000)	
i	50		<del>                                      </del>	<del>-                                     </del>			<del>               </del>	N.Moi		I RTICALE SIZE	Mo	25.0	#			R (ASTM D1	883) T	
% Passing Sieve	g 40 30							11		METERS		21.0	+	Ш,	CBR Det. @			
3		+					<del>-                                     </del>	D 60	DIAI	VIETERS		10.0 Number of Blows		100.0	% EXPANSION CONSOLIDATE			
	10	+++	++++++	<del>-                                     </del>		$\parallel \parallel \parallel$	<del></del>	D 30							I SOLIDA		1	
1	0	+				''		טט ט	-	+ +	1				ام ا	b.Manage	r	
1	C	0.01	0.1	1		10		D 10							La	v.iviai iaye	<u>.</u>	



Company			TETRA	TECH		Sampling Da	ate			10/11/20	13	
Project		Geotechnica	l Explorationn fo Parwan Provinc			Testing Date	<b>9</b>			19/11/20	13	
3H #		3	Depth(m)	0.75	Tested By		Hikma			:		
Horizontal		Sample	No. 1			Sample I	No. 2			Sampl	e No. 3	
Gage Shear Displacement	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress
(0.01 mm)	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2
0.0	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000
25.0	0.03	2.00	1.60	0.015822	0.06	6.10	4.87	0.048256	0.12	6.10	4.87	0.048256
50.0	0.05	3.30	2.64	0.026106	0.11	8.50	6.79	0.067243	0.15	11.00	8.79	0.087020
75.0	0.07	4.60	3.68	0.036390	0.14	10.60	8.47	0.083855	0.20	15.90	12.70	0.125783
100.0	0.10	7.90	6.31	0.062496	0.16	14.30	11.43	0.113126	0.23	21.10	16.86	0.166920
125.0	0.13	10.70	8.55	0.084647	0.18	18.40	14.70	0.145560	0.25	27.20	21.73	0.215176
150.0	0.15	12.70	10.15	0.100468	0.20	22.70	18.14	0.179577	0.30	32.40	25.89	0.256313
175.0	0.17	16.10	12.86	0.127365	0.22	24.20	19.34	0.191444	0.32	36.30	29.00	0.287165
200.0	0.22	18.10	14.46	0.143187	0.23	28.30	22.61	0.223878	0.36	42.10	33.64	0.333049
250.0	0.24	18.80	15.02	0.148725	0.26	30.20	24.13	0.238909	0.39	50.20	40.11	0.397127
300.0	0.26	19.60	15.66	0.155053	0.30	34.20	27.33	0.270552	0.41	55.30	44.18	0.437472
400.0	0.28	21.00	16.78	0.166129	0.33	38.20	30.52	0.302196	0.44	57.10	45.62	0.451712
500.0	0.28	21.00	16.78	0.166129	0.35	40.10	32.04	0.317227	0.46	60.10	48.02	0.475445
600.0	0.25	19.80	15.82	0.156636	0.35	40.10	32.04	0.317227	0.49	62.10	49.62	0.491266
700.0	0.27	19.50	15.58	0.154262	0.37	39.60	31.64	0.313271	0.49	62.10	49.62	0.491266
800.0	0.27	19.30	15.42	0.152680	0.37	39.10	31.24	0.309316	0.48	61.50	49.14	0.486520
900.0	0.26	18.80	15.02	0.148725	0.36	38.40	30.68	0.303778	0.48	60.90	48.66	0.481773
1000.0	0.25	18.00	14.38	0.142396	0.36	38.10	30.44	0.301405	0.47	60.30	48.18	0.477027
Description of Soil (Class)				SM		Strain Rate				0.5 mm/m	in	
Sample No.			1	2	3	Type of Tes	t			CD		
Normal Stress, kg/cm <sup>2</sup> 0.244500 0.486900				0.734600	Proving Ring Calibration Factor					0.52 kg/Div		



# Shawal Geotechnical Engineering and Materials Testing Laboratory

Company		TETRA T	ECH	Sampling Date	10/11/2013
Project	Geotechnical Ex	plorationn for Salar Province, Afgl	ng Tunnel Substation, Parwan nanistan	Testing Date	19/11/2013
BH#	3	Depth(m)	0.75	Description of Soil	SM

#### DIRECT SHEAR TEST (ASTM D3080)

Type of Test	CD						
Strain Rate		0.5 mm/min					
Sample No.	1	2	3				
Normal Stress, kg/cm²	0.244500	0.486900	0.734600				

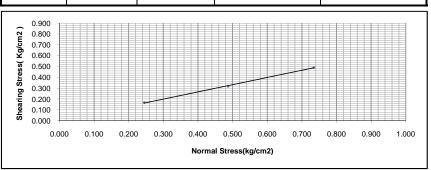
#### SOIL SPECIMEN MEASUREMENTS

Diameter	(cm)	9.99	9.99	9.99
Height	(cm)	2	2	2
Area	(cm²)	99.8	99.8	99.8
Volume	(cm³)	199.6	199.6	199.6
Weight of Soil + Split Former	(g)	464.2	464.0	463.3
Weight of Split Former	(g)	119	119	119
Weight of Soil	(g)	345.23	345.03	344.33
Wet Unit Weight	(kg/cm3)	1.73	1.73	1.73
Dry Unit Weight	(kg/cm3)	1.67	1.68	1.67

#### WATER CONTENT DETERMINATION

O		4		7.00
Container No.		1	2	3.00
Weight of Wet Soil + Container	(g)	121.4	134.8	138.3
Weight of Dry Soil + Container	(g)	118.3	131.8	135.2
Weight of Water	(g)	3.042	3.05	3.10
Weight of Container	(g)	32.198	35.71	33.13
Weight of Dry Soil	(g)	86.14	96.058	102.11
Water Content	(%)	3.53	3.18	3.04

Sample No.	Water (	Content %	Normal Stress kg/cm <sup>2</sup>	Max. Shearing Stress
	before test	after test	]	kg, omiz
1	3.53	3.30	0.244500	0.166129
2	3.18	2.82	0.486900	0.317227
3	3.04	2.63	0.734600	0.491266



Cohesion, $C =$	0.000	Kg/cm2	
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🖎 Angle =	30.0	Degree
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Shawal Geotechnical Engineering /Materials Testing Laboratory

# Appendix G

Field working and Laboratory analysis Photos

Shawal Geotechnical & Material Testing Laboratory



#### Shawal Geotechnical Engineering /Materials Testing Laboratory

**1-** General view of the project site













## Shawal Geotechnical Engineering /Materials Testing Laboratory

#### **2-** Boreholes boring photos













### Shawal Geotechnical Engineering /Materials Testing Laboratory

#### **1-** Test Pit Excavation Photos



























## Shawal Geotechnical Engineering /Materials Testing Laboratory

#### **2-** Lab Testing Photos













Shawal Geotechnical Engineering / Materials Testing Laboratory

# Appendix H

Laboratory Certificate by (USACE-AED)

Shawal Geotechnical & Material Testing Laboratory



ATTENTION OF:

#### DEPARTMENT OF THE ARMY

AFGHANISTAN ENGINEER DISTRICT U.S. ARMY CORPS OF ENGINEERS KABUL, AFGHANISTAN APO, AE 09356

CE-TAN 12 Nov 2012

#### LABORATORY INSPECTION AND CERTIFICATION FOR

#### **Shawal Geotechnical Materials Lab**

This letter confirms the completion of inspection and certification for the **Shawal Geotechnical Materials Lab** at the following locations in Afghanistan: Kabul. While **Shawal Geotechnical Materials Lab** has one physical lab location in Kabul, they can perform field tests anywhere in Trans Atlantic District – North (TAN). They will also be recommended for use anywhere in Trans Atlantic District – South (TAS).

This laboratory should now be considered as certified for use by the Trans Atlantic District – North (TAN), U.S. Army Corps of Engineers (USACE), for the quality control tests listed in Tables 1 through 7. This certification will be included with records that are maintained at the AEN Headquarters in Kabul, Afghanistan. Retaining certification will require yearly inspections by the AED. This certification is valid through 11 NOV 2013. This certification is also contingent upon the continued employment of Mr. Mohammad Ashraf, President/Senior Laboratory manager, Mr. Ahmad Shahpoor, Senior Laboratory Engineer and Mr. Zafar Ahmad, Geologist. Without the oversight of these gentlemen, the laboratory will require recertification. Finally, if the laboratory is moved to a new location, it will require recertification.

The inspection and certification process for the **Shawal Geotechnical Materials Lab** adhered to procedures outlined by the Materials Testing Center (MTC), which is located at the Geotechnical and Structures Laboratory (GSL), U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi, USA. The MTC is the USACE-authorized agency for certifying laboratories for use in quality control testing for USACE construction projects. To facilitate construction in Afghanistan, the AEN has authorized the Chief of the Quality Assurance Branch to conduct laboratory certifications with strict adherence to MTC protocol.



Assistant Chief, Construction Branch Trans Atlantic District – North U.S. Army Corps of Engineers

Certified Material Test Procedures Include:

Soils (27 test procedures)
Aggregate (24 test procedures)
Cement, Grout, Mortar, and Concrete (38 test procedures)
Asphalt (39 test procedures)
Bricks, Stone, and CMU (10 test procedure)
Advance Soil Tests (13 test procedures)
Steel Testing (4 test procedures)
Water well tests and report
Calibration Services
Materials Testing Training Program

Attachment (7 pages)

## Shawal Geotechnical Materials Testing Lab Certified Laboratory Tests

Table 1. Soils

<b>Test Method</b>	Test Procedure Title
ASTM D 421	Dry Preparation of Soil Samples for Particle-Size Analysis and
	Determination of Soil Constants
ASTM D 422	Particle-Size Analysis of Soils
ASTM D 427	Shrinkage Factors of Soils by the Mercury Method
ASTM D 558	Moisture-Density Relations of Soil-Cement Mixtures
ASTM D 698	Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 854	Specific Gravity of Soil Solids by Water Pycnometer
ASTM D 1140	Amount of Material in Soils Finer than the No. 200 (75-um) Sieve
ASTM D 1556	Density and Unit Weight of Soil in Place by the Sand Cone Method
ASTM D 1557	Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D 1883	CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D 2166	Unconfined Compressive Strength of Cohesive Soil
ASTM D 2216	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487	Classification of Soils for Engineering Purposes
ASTM D 2488	Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3282	Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
ASTM D 3740	Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4643	Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating
ASTM D 4718	Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D 6951	Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications
AASHTO T 92	Determining the Shrinkage Factors of Soils
AASHTO T 93	Determining the Field Moisture Equivalent of Soils
AASHTO T 224	Correction for Coarse Particles in the Soil Compaction Test
CRD-C 654	Standard Test Method for Determining the California Bearing Ratio of Soils (Field Test)
BS 1377-2	Determination of Liquid Limit by Cone Penetration Method

Table 2. Aggregates

<b>Test Method</b>	Test Procedure Title
ASTM C 29	Unit Weight and Voids in Aggregate
ASTM C 40	Organic Impurities in Fine Aggregates for Concrete
ASTM C 70	Surface Moisture in Fine Aggregate
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium
	Sulfate
ASTM C 117	Material Finer than 75 um (No. 200) Sieve in Mineral Aggregates by
ASTWC 117	Washing
ASTM C 127	Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion
ASTWC 131	and Impact in the Los Angeles Machine
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	Clay Lumps and Friable Particles in Aggregates
ASTM C 289	Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C 295	Petrographic Examination of Aggregates for Concrete
ASTM C 535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion
	and Impact in the Los Angeles Machine
ASTM C 566	Total Moisture Content
ASTM C 702	Reducing Samples of Aggregate to Testing Size
ASTM C 1252	Uncompacted Void Content of Fine Aggregate (as Influenced by Particle
ASTIVI C 1232	Shape, Surface Texture, and Grading)
ASTM D 75	Sampling Aggregates
ASTM D 2419	Sand Equivalent of Soils and Fine Aggregate
ASTM D 4791	Flat Particles, Elongated Particles, or Flat and Elongated Particles in
AGTW D 4771	Coarse Aggregate
ASTM D 4944	Field Determination of Water (Moisture) Content of Soil by the Calcium
	Carbide Gas Pressure Tester
ASTM D 5821	Determining the Percentage of Fractured Particles in Coarse Aggregate
CRD-C 171	Standard Test Method for Determining Percentage of Crushed Particles
CKD-C 1/1	in Aggregate
BS 812 Section	Testing Aggregates. Methods for Determination of Particle Shape.
105.1	Flakiness Index.
BS 812 Section	Testing Aggregates. Methods for Determination of Particle Shape.
105.2	Elongation Index for Coarse Aggregate.

Table 3. Cement, Grout, Mortar, and Concrete

<b>Test Method</b>	Test Procedure Title
ASTM C 31	Making and Curing Test Specimens in the Field
ASTM C 39	Compressive Strength of Cylindrical Specimens
ASTM C 42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 78	Flexural Strength of Concrete (Using Simple Beam with Third-Point
	Loading)
ASTM C 109	Compressive Strength of Hydraulic Cement Mortars
ASTM C 114	Chemical Analysis of Hydraulic Cement
ASTM C 138	Unit Weight and Air Content by Gravimetric
ASTM C 143	Slump of Hydraulic-Cement Concrete
ASTM C 151	Autoclave Expansion of Hydraulic Cement
ASTM C 172	Sampling Freshly Mixed Concrete
ASTM C 174	Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C 185	Air Content of Hydraulic Cement Mortar
ASTM C 187	Normal Consistency of Hydraulic Cement
ASTM C 188	Density of Hydraulic Cement
ASTM C 191	Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C 192	Making and Curing Test Specimens in the Laboratory
ASTM C 204	Fineness of Hydraulic Cement by Air-Permeability Apparatus
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 232	Bleeding of Concrete
ASTM C 359	Early Stiffening of Hydraulic Cement (Mortar Method)
ASTM C 430	Fineness of Hydraulic Cement by the 45-um (No. 325) Sieve
ASTM C 451	Early Stiffening of Hydraulic Cement (Paste Method)
ASTM C 470	Molds for Forming Concrete Test Cylinders Vertically
ASTM C 511	Moist Cabinets, Moist Rooms, Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
ASTM C 617	Capping Cylindrical Concrete Specimens
ASTM C 642	Density, Absorption, and Voids in Hardened Concrete
ASTM C 803	Penetration Resistance of Hardened Concrete
ASTM C 805	Rebound Number of Hardened Concrete
ASTM C 856	Petrographic Examination of Hardened Concrete
ASTM C 1019	Sampling and Testing Grout
ASTM C 1064	Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1074	Estimating Concrete Strength by the Maturity Method
ASTM C 1077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1084	Portland-Cement Content of Hardened Hydraulic-Cement Concrete
ASTM C 1437	Flow of Hydraulic Cement Mortar
ASTM C 1602	Mixing Water Used in the Production of Hydraulic Cement Concrete
AASHTO T 26	Quality of Water to be Used in Concrete
AASHTO T 132	Standard Method of Test for Tensile Strength of Hydraulic Cement Mortars

Table 4. Asphalt Cement and Asphalt Concrete

<b>Test Method</b>	Test Procedure Title
ASTM D 5	Penetration of Bituminous Materials
ASTM D 36	Softening Point of Bitumen (Ring-and-Ball Apparatus)
ASTM D 70	Density of Semi-Solid Bituminous Materials (Pycnometer Method)
ASTM D 88	Saybolt Viscosity
ASTM D 92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D 95	Water in Petroleum Products and Bituminous Materials by Distillation
ASTM D 113	Ductility of Bituminous Materials
ASTM D 140	Sampling Bituminous Materials
ASTM D 110	Mineral Filler for Bituminous Paving Mixtures
ASTM D 402	Distillation of Cutback Asphaltic (Bituminous) Products
ASTM D 546	Sieve Analysis of Mineral Filler for Bituminous Paving Mixtures
ASTM D 979	Sampling Bituminous Paving Mixtures
ASTM D 1074	Compressive Strength of Bituminous Mixtures
ASTM D 1074 ASTM D 1754	Effects of Heat and Air on Asphaltic Materials (Thin-Film Oven Test)
ASTM D 1/34	Theoretical Maximum Specific Gravity and Density of Bituminous
ASTM D 2041	Pavement Mixtures
ASTM D 2042	Solubility of Asphalt Materials in Trichloroethylene
ASTM D 2170	Kinematic Viscosity of Asphalts (Bitumens)
ASTM D 2171	Viscosity of Asphalts by Vacuum Capillary Viscometer
ASTM D 2172	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2489	Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D 2726	Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D 2872	Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)
ASTM D 3203	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D 3549	Thickness or Height of Compacted Bituminous Paving Mixture Specimens
ASTM D 3665	Random Sampling of Construction Materials
ASTM D 3666	Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D 5361	Sampling Compacted Bituminous Mixtures for Laboratory Testing
ASTM D 5444	Mechanical Size Analysis of Extracted Aggregate
ASTM D 6926	Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D 6927	Marshall Stability and Flow of Bituminous Mixtures
CRD-C 649	Standard Test Method for Unit Weight, Marshall Stability, and Flow of Bituminous Mixtures
CRD-C 650	Standard Method for Density and Percent Voids of Compacted Bituminous Paving Mixtures
CRD-C 652	Standard Test Method for Measurement of Reduction in Marshall Stability of Bituminous Mixtures Caused by Immersion in Water
AASHTO T 59	Standard Method of Test for Emulsified Asphalts
AASHTO T 79	Flash Point with Tag Open-Cup Apparatus for Use with Material Having a Flash Less Than 93.3°C (200°F)
AASHTO T 102	Spot Test of Asphaltic Materials
AASHTO T 182	Coating and Stripping of Bitumen-Aggregate Mixtures
AASHTO T 230	Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures

AASHTO T 283	Standard Method of Test for Resistance of Compacted Hot Mix Asphalt
	(HMA) to Moisture-Induced Damage

Table 5. Bricks, Stone, and Concrete Masonry Units

<b>Test Method</b>	Test Procedure Title
ASTM C 62	Building Brick (Solid Masonry Units Made From Clay or Shale)
ASTM C 67	Sampling and Testing Brick and Structural Clay Tile
ASTM C 90	Loadbearing Concrete Masonry Units
ASTM C 97	Absorption and Bulk Specific Gravity of Dimension Stone
ASTM C 99	Modulus of Rupture of Dimension Stone
ASTM C 140	Sampling and Testing Concrete Masonry Units and Related Units
ASTM C 170	Compressive Strength of Dimension Stone
ASTM C 880	Flexural Strength of Dimension Stone
ASTM C 1093	Accreditation of Testing Agencies for Unit Masonry
ASTM C 1552	Practice for Capping Concrete Masonry Units, Related Units, and
	Masonry Prisms for Compression Testing

Table 6. Advanced Soils Testing

Test Method	Test Procedure Title
	Repetitive Static Plate Load Tests of Soils and Flexible Pavement
ASTM D 1195	Components, for Use in Evaluation and Design of Airport and Highway
	Pavements
	Nonrepetitive Static Plate Load Tests of Soils and Flexible Pavement
ASTM D 1196	Components, for Use in Evaluation and Design of Airport and Highway
	Pavements
ASTM D 1586	Penetration Test and Split-Barrel Sampling of Soils
ASTM D 2434	Permeability of Granular Soils (Constant Head)
ASTM D 2435	One-Dimensional Consolidation Properties of Soils Using Incremental
	Loading
ASTM D 2573	Field Vane Shear Test in Cohesive Soil
ASTM D 2850	Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 3080	Direct Shear Test of Soils Under Consolidated Drained Conditions
ASTM D 3385	Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer
ASTM D 4767	Consolidated Undrained Triaxial Compression Test for Cohesive Soils
ASTM D 5084	Measurement of Hydraulic Conductivity of Saturated Porous Materials
	Using a Flexible Wall Permeameter
ASTM E 2396	Saturated Water Permeability of Granular Drainage Media [Falling-Head
	Method] for Green Roof Systems
ASTM D 5333	Collapse Potential Test

Table 7. Steel

Test Method	Test Procedure Title
ASTM A 370	Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A 615	Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM E 8	Tension Testing of Metallic Materials
AASHTO T 285	Bend Test for Bars for Concrete Reinforcement

#### Table 8. Water Well Testing and report

Water Quantity/ discharge test
Water Step Draw Down test
Recovery Test
Water well soil sampling and testing
Water well geological log preparation
Water Well Design
Complete Water Well Report

#### Table 9. Calibration Services

Calibration for all Lab Equipment Calibration of Asphalt Plant Calibration of Concrete Batching Plant Calibration of Truck Scale/Weigh Calibration &Installation of Plants,Scales

#### Table 10. Materials Testing Training Program

Available Courses Include:
Soil Sampling and Testing
Aggregate Sampling and Testing
Concrete Sampling and Testing
Cement Sampling and Testing
Bitumen Sampling and Testing
Hot Mix Asphalt (HMA) Sampling and Testing
Geotechnical Investigation Sampling and Testing
Steel Sampling and Testing



#### DEPARTMENT OF THE ARMY U.S. ARMY CORPS OF ENGINEERS AFGHANISTAN ENGINEER DISTRICT - SOUTH APO AE 09355

CETAS-EC-QAB

03 APRIL 2012

#### 2012 INSPECTION AND CERTIFICATION FOR THE

## SHAWAL GEOTECHNICAL ENGINEERING AND MATERIALS TESTING LABORATORY (GEMTL) AT KAF

This letter confirms the completion of 2012 inspection and certification for the Shawal GEMTL at KAF, Afghanistan. While this laboratory is located in KAF, the facility will be approved to conduct field tests anywhere in Afghanistan Engineer District (AED)—South. The laboratory will also be recommended for use anywhere in AED – North.

The inspection/evaluation is based on ASTM lab checklists and procedures including facility, equipment, calibration, knowledge, personnel, references, reporting and attitude. The inspection reflected the lab's positive and professional reputation.

This laboratory is certified for use by Afghanistan Engineer District South for the construction materials tests listed in lab inspection checklist (attached) conditional on compliance with ASTM and USACE standards. This certification will be included with records that are maintained at the AED Headquarters in KAF, Afghanistan. Retaining certification will require yearly inspections by AED-S. This certification is also contingent upon the continued employment of Deputy Manager Zafar Ahmad, Sr. Lab Technician and Ahmad Shah Poor, Lab Manager. Without the oversight of these gentlemen, the laboratory will require recertification. Also, if the laboratory moves to a new location, it will require recertification.

The inspection and certification process for the Shawal GEMTL Laboratory adhered to procedures outlined by the Materials Testing Center (MTC), located at the U.S. Army Engineer Research and Development Center (ERDC). Vicksburg, Mississippi, USA. The MTC is the USACE agency for certifying labs for quality control testing for USACE construction projects. To facilitate construction in Afghanistan, AED-S has authorized this author to conduct laboratory inspections and certifications with adherence to MTC standards.



Quality Assurance Branch
Afghanistan Engineer District – South
U.S. Army Corps of Engineers

Afghanistan Engineer District - South U.S. Army Corps of Engineers

CETAS-EC-QAB

SUBJECT: 2012 INSPECTION AND CERTIFICATION FOR THE SHAWAL GEMTL

#### Attachment (9 pages)

Certified Material Test Procedures Include (lab inspection checklist):

Aggregate (21 test procedures)

Bituminous (10 test procedure)

Concrete (9 test procedures)

Masonry (5 test procedures)

Soils (14 test procedures)

SHAWAL GEMTL – Equipment Calibration Upon Request SHAWAL GEMTL – Curriculum Vitae Upon Request SHAWAL GEMTL – Lab Photos Upon Request